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Museum Resources and Mobile Technology in Classroom Curriculum

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Museum Resources and Mobile Technology in Classroom Curriculum

by

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Dedication

I dedicate this thesis to my mom and my sister Tara. Thank you for believing in me fully and constantly encouraging me to follow my passions, even when it led me a thousand miles away to Texas. I'll love you forever, and I'll like you for always.

A special thank you to Theo and Nico, for the reassurance that I could finish, and that you two would be there waiting for me when I did.

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And last, but certainly not least, I must acknowledge the teachers who inspired me to conduct this research, and inspire me to continue my journey of learning. I hope I continue to make you proud.

Abstract

Museum Resources and Mobile Technology in Classroom Curriculum

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In the United States, both Common Core standards and 21st century learning skills are dictating educational policy, while teachers are expected to teach to standardized tests while also providing students authentic learning experiences. Creating these authentic learning experiences involves not only ensuring learning will occur, but also connecting the lesson to real world examples. These connections are increasingly made possible in classrooms through the use of mobile technology. Art museums are also taking advantage of digital tools to develop mobile applications that extend interactions with artworks beyond the museum's walls. It is at this intersection of classrooms, mobile technology, and art museums that this study originated. The study focuses on how two elementary educators integrated online art museum resources into their curriculum using mobile technology, and what pertinent implications arise from these experiences that can be applied to developing substantive art museum resources.

I prepared myself for the study by reviewing literature concerning constructivism (Hein, 1990), andragogy (Knowles, 1990), mobile technology, technology integration into classrooms, and art museum resources. Working alongside one art specialist and one

math teacher, I sought to understand each teacher's experience with bringing art museum mobile applications and iPads into their curriculum. It was important to include in the study my voice as a researcher, as well as the voices of the teachers. I, therefore, adopted a narrative approach to reporting the data that enabled our three stories to intersect. The trio of narratives reflect our experiences as I interacted with the teachers as they designed and conducted lessons that utilized museum developed mobile applications of their choice and hosted on iPads. I used the Technological, Pedagogical, and Content Knowledge (TPACK) framework (Koehler, Mishra, & Cain, 2013) to identify how each teacher's technological, pedagogical, and content knowledge areas interacted during their teaching. Both educators' familiarity with, and evolution of, their technological pedagogical knowledge correlated with their perceived success of the lesson. From the teachers' experiences, I was better able to identify and understand the importance of collaborating with teachers in research, the unique opportunities for increasing interaction with art museum objects by embracing mobile technology, and the potential for collaborating between universities and art museums in digital projects.

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Chapter 1: Introduction

This study emerged from research concerning mobile technology, art museums, and what impact mobile technology could have on the offerings of art museums, specifically for elementary teachers. Mobile technology has taken the power of personal computers and shrunk them down to fit into the palm of a hand (or even the watch on a wrist). Tablets, smart phones, and laptop computers are certainly ubiquitous in society and are becoming increasingly valuable in classrooms around the world, as is the constant access to information available through the Internet (Johnson, Adams, Estrada, & Freeman, 2014). With this easy access to information, teachers are needing to move away from disseminating facts for quick recall, to enabling students to create deeper, interdisciplinary knowledge of concepts. As the national education attitude turns away from fact-based methods of learning to notions of meaning-making (McTighe & Seif, 2014), some educational policymakers, along with the National Education Association (NEA), have advocated for the implementation of a 21st Century Learning Framework (Partnership for 21st Century Learning, 2015). Twenty-first century skills in the classroom address the life, technology, and innovation skills, such as cooperation, creativity, and flexibility, alongside the interdisciplinary content knowledge necessary for students to "succeed in work and life in the 21st century" (Partnership for 21st Century Learning, 2015, p. 2).

Given its support from the NEA, the 21st century framework. has earned support from many districts throughout the United States, bringing about changes in learning environments, curriculum and instruction, standards and assessments, and professional development (P21, 2015). Within these structural changes is the need for current teachers to implement technological tools, such as mobile devices. Some districts provide support

for teachers as they begin to integrate technology into their classrooms, though research suggests there is more that needs to be done to ensure these teachers are properly supported (Eteokleous, 2007; Mills & Tincher, 2003; Wallinger, 1997; West, 1998; Zhao & Frank, 2003). In tandem with this integration of technology devices is the need to include quality technology-based learning experiences in classroom curriculum. Teachers must find resources that align with strict national and state standards, not to mention adjust their pedagogy to utilize the new tools.

Given this transition occurring in schools, institutions such as art museums are focusing efforts to provide teachers with only standards-based classroom resources (Marable-Bunch, 2010). Some teachers have utilized content that brings the museum's collection into the classroom digitally. Art museums house collections ripe for curricular connections between all disciplines. A study of how a contemporary art specialist and a generalist school teacher would provide a context for how and when art museum resources are implemented in curriculum is needed. Attention must be paid to understanding what characteristics make them valuable for use in the classroom. If schools and teachers are shifting towards mobile technology, art museums must ensure the resources their education departments create are reflective of the needs of contemporary teachers, which means meeting the current educational standards while also taking advantage of the possibilities in digital technology.

CENTRAL RESEARCH QUESTION

The following question motivated and guided this research:

What can be learned from how an elementary art specialist and a general classroom teacher use mobile technology to integrate museum resources into their

curriculum, and what are the implications to the educational resources and programming that museums provide teachers?

PROBLEM STATEMENT

The presence of technology in today's society has transformed how people interact and learn. Today's students are so familiar with technology that they have been deemed digital natives, a group described as "tech-savvy, highly social, always connected, collaborative, multitasking…desiring open access to everything, and leading 24/7 lives" (Gawelek, 2011, p. 28). These digital natives will become adults in a world with unprecedented technology use, and where educational stakeholders, such as the Partnership for 21st Century Learning[1], are focused on preparing students for this technology-fueled, global future through acquiring 21st century skills. This knowledge encompasses a wide-reaching array of educational elements, including an emphasis on problem-solving and creativity abilities, learner-centered classrooms, and collaboration, in hopes of developing students better equipped for a global job market (Partnership for 21st Century Learning, 2011). Twenty-first century learners are expected to be tech-savvy collaborators who communicate well and think both critically and creatively, while also demonstrating information and media literacy with a flexible and adaptable demeanor. Research (Fisher, Lucas, & Galstyan, 2013; Wakefield & Smith, 2012) indicates the use of iPads and other tablet technologies as successful tools for students to hone these 21st century skills, and as such, districts are investing in them for the classroom.

[1] The Partnership for 21st Century Learning is a non-profit organization founded between education, business, community, and government members, working together to generate research and resources to support the notion of 21st century learning.

The shift towards technology-facilitated learning also indicates an increased pressure on teachers to integrate technology into their teaching. Some school districts have purchased tablets or laptop computers for use in the classroom, while others encourage a Bring Your Own Device (BYOD) culture, where students bring to school a mobile device of their choosing. Once the devices are present in the classroom, though, there is still work to be done. Research indicates, however, concerns are arising surrounding the types and quality of the professional development teachers given in order to create technology infused curriculum (Eteokleous, 2007; Mills & Tincher, 2003; Wallinger, 1997; West, 1998; Zhao & Frank, 2003). School districts provide teachers some training to use their new tools, but some criticize that this training may not meet teachers' needs (Wallinger, 1997). Research also shows training fails to acknowledge the importance of time in developing the skills necessary for effective technology integration (Hosman & Cvetanoska, 2013).

Simultaneously, many art museums are expanding their educational offerings to take advantage of connecting to the teacher audience online (Sayre & Wetterlund, 2002). For some museums, this means digitizing previously printed teacher materials, though others are also developing multimedia content such as mobile applications. Some of the mobile applications offer interaction with collections in a variety of ways, including games, digital gallery tours, and links to additional online content. One study investigated a sample of art applications in terms of their potential classroom use (Katz-Buonincontro & Foster, 2013). These included some games and tours, though only some of the applications came from art museums. By analyzing the content of the applications rather than putting them into practice with a teacher in a classroom, the study overlooked the effects of a classroom teacher's implementation. Paying close attention to how art museum mobile applications can be used by teachers in a classroom setting will provide

art museum education and digital interpretation staff with insight necessary to develop online resources that can be used effectively in contemporary classrooms settings.

SPECULATIONS ABOUT THIS INVESTIGATION

I knew there were many different possibilities of what could happen during my research. I anticipated I would likely find teachers with varying degrees of experience with mobile technology and museum resources, both factors that would affect the outcomes of the study. A teacher who has not used mobile technology in the classroom may require help understanding how to use a device, how to find a resource that fits the curriculum, and may be uncomfortable using the device for the first time, especially while being studied. A teacher more seasoned in technology use in the classroom, on the other hand, may offer insight to more nuanced ways of integrating museum resources. Regardless of whether they are well versed with technology or not, it was my assumption that both teachers would be digital immigrants, as opposed to their students who would be digital natives. I expected working with these teachers could require some of my technological expertise, whether this meant giving basic hardware instruction or being available for troubleshooting.

Each teacher's comfort level with museum resources would have an impact in their lesson planning process, especially if the teacher was unfamiliar with mobile devices as well. A teacher well versed in museum resources, however, could be unaware of those available for mobile devices, if they have not used mobile devices in the classroom. A teacher who used mobile technology may not use the devices to access museum resources, so they may need assistance finding an appropriate resource. I expected to learn about how I can provide teachers with suggestions for potential online resources, and I sought to understand what would motivate a teacher to use one resource

over another. Once the teachers had chosen one online art museum resource, I expected to see the resources used would accomplish different curricular goals, for example as an introduction or assessment of a topic. A teacher could choose to use an art game or a digital tour, either as a supplement to a unit of study or as a fun reward, depending on what they needed to accomplish in their curriculum. Many of the outcomes of this thesis depended on the variety of experience and the curricular intentions the teacher participants possess, and I must be careful not to assume the motivations for teachers' decisions.

RESEARCH METHOD

It is exactly this need for understanding teachers' reasoning for making choices about how and what to use in their classroom that calls for a qualitative case study (Stake, 2010). Stake explains qualitative case studies rely on human experience. Yin (2014) goes further, specifying a researcher should observe the phenomenon "within its real world context" (p. 16). Observing teachers in their classrooms is key to understanding how they will use mobile technology in conjunction with art museum resources. I chose to work with two teachers, one generalist and one art specialist, in order to understand implications about art museum resources and mobile technology for both art and other content areas. I used a network sample (Yin, 2014) to gather two teacher participants, Jon and June[2], both of whom taught at Austin Discovery School, a charter school in Austin, Texas. I aimed to understand how each teacher came to decisions about what and how museum resources would be used for their classrooms, so I asked them to reflect on choices they made by participating in two semi-structured interviews, classroom observations, providing me lesson plan documents, and keeping a journal.

[2] Pseudonym used.

After I collected the data, I needed to analyze it in a way to make sense of the complex practice that is teaching. I chose to utilize Mishra and Koehler's (2006) Technological, Pedagogical, and Content Knowledge (TPACK) framework, because of its emphasis on understanding a teacher's knowledge relating to technology, pedagogy, and content individually as well as how these areas of knowledge impact one another. Through these individual areas and their intersections, the TPACK framework contributes a means to describe a teacher's teaching practice with technology. This descriptive nature of the TPACK framework lends itself to creating evaluative tools for technology integration specialists and teachers alike (Koehler, Mishra, & Cain, 2013). For my thesis, the goal is to understand teaching behaviors that help characterize the teacher participant's experience with mobile technology and art museum resources, rather than evaluate the teacher's or resource's effectiveness. In reporting these experiences, it is necessary to report them narratively, since the narrative relies on a person's lived experience (Webster & Mertova, 2007). Because of my own complex relationship to museum education and technology, it was important to include my own lived experience as well. I thus created a trio of narratives, from each teacher's and my perspective, about our interactions together. Each teacher's story is unique. Telling the stories of how they planned and executed their lessons, as well as how I interacted with them, through narrative enabled me to identify the values within their decision making (Chase, 2003). Connecting my use of TPACK in data analysis to narrative reporting helped me find the common links between the values the teachers hold, how these values are reflected in the content they choose to teach (Gudmondsdottir, 1995), and in what ways technology enables or hinders their ability to accomplish their goals. These elements are important for understanding how teachers integrate art museum resources into classroom

curriculum, as well as what information can be used in developing future art museum resources for elementary schools.

DEFINITION OF TERMS

iPad

A handheld, touchscreen tablet first distributed by Apple in 2010 (Kastrenakes, 2015). Annually, a new version is released, though most versions have a camera, speakers, headphone jack, media storage, Bluetooth, and wifi connectivity. Some iPads can be equipped to access the Internet through 3G and LTE data plans. iPads run the iOS operating system and come with an array of basic applications. Users can customize their iPad through the App Store, an online marketplace where users can download mobile applications such as games, streaming services, and e-book readers. iPads are currently the most popular choice for mobile technology in classrooms (Benton, 2012) because of the vast market of educational content that has been developed specifically for them. Both teachers in this study opted to use iPads.

Mobile Application

A piece of software, often referred to as a mobile app, which enables users to communicate and enjoy entertainment (Clark, 2012). These software applications are operated on a smartphone or tablet and aim to deliver the same type of functionality a user can expect from a personal computer.

Mobile Technology

Small, primarily hand-held, computing devices with cellular or wireless connectivity to the Internet, GPS, Bluetooth, and media storage (Ryan, 2013). They are known for being light-weight and portable, enabling interactivity with a touch screen,

speakers, and an audio jack. These small computers run an operating system, to which users can download small applications that provide specialized gaming, educational resources, or organizational experiences. iPads were used in this project.

Museum Resources

A suite of content developed by museums and institutions to share information about collections or related topics. This thesis focused on educational resources developed by art museum staff, which in the past included slide images, lesson plans, background information, posters, postcards, and teacher workshops offered by museums and institutions to provide art tools for the teacher audience (Berry, 1998). As museums have embraced technology, their resources have become increasingly digital, providing downloadable images of collections, lesson plans, and mobile applications, as well as webinars (Sayre & Wetterlund, 2003).

LIMITATIONS OF THIS STUDY

This thesis focused specifically on two elementary school teachers and their use of two online art museum resources. The stories told here provide implications and recommendations for other teachers and resources, though they are not meant to be generalizations about all teachers and all resources. Teachers in this thesis actively used digital resources, though findings will relate to other types of resources as well. This thesis research was conducted at Austin Discovery School, which is a charter school. Charter schools often operate under different administrative and cultural practices than public schools, thus the implications for this study may be different than if it was conducted at a public school. This charter school emphasizes "interactive, hands-on lessons and relevant project-based learning" (Austin Discovery School Mission, 2015), indicating that classroom practices may vary from traditional public school.

SIGNIFICANCE OF STUDY

Classroom teachers are a significant audience for art museum education staff, and online museum resources are a key way to connect classroom curriculum to a museum's collection. With the popularity of mobile devices growing rather than declining, and the need to include state and national standards into the teacher resources museums provide (Marable-Bunch, 2010), an analysis of how classroom teachers are actively using mobile resources is necessary. This thesis is centered on the two teachers I worked with, including their experiences developing and teaching a lesson and what these experiences taught them about learning how to use mobile technology. From these experiences, I sought to find what is beneficial in terms of developing future online museum resources. This study aimed to use the voice of two elementary school teachers to give feedback and provide insight for museum educators through the investigation of mobile technology and art museum resources. From this information, I draw suggestions for future research as well as knowledge beneficial to both museums and those working to integrate technology into classrooms.

CONCLUSION

The following chapters rely on a collaboration with two elementary teachers to explore how art museums and technology can impact the classroom through online art museum resources and mobile devices. Chapter 2 explains the literature I reviewed in order to conduct this research, considering constructivist learning, 21st century skills, and andragogy, as well as mobile technology implementation and the evolution of museum resources. Chapter 3 explains the methodology I employed for this study, including how case study and narrative research work hand-in-hand to conduct teacher research. These first three chapters serve to set the foundation of my study, while the next three chapters explore the data of the study. The fourth chapter serves as my narrative, outlining several

stories from my own life, written with the purpose of explaining why I am motivated to conduct this research and how my background informs the study. In Chapters 5 and 6, I tell the stories of the teacher participants, Jon and June, and our journey using mobile technology in their classroom curriculum. The seventh chapter concludes with a consideration of the data in terms of what school districts, museums, and the field of art education can benefit from through this study.

Chapter 2: Literature Review

Engaging in this study means exploring not only a single pair of classrooms, but gaining an understanding of the concepts at hand in education today. The teachers I worked with function in this complex world, where theory, trends, tools, policies, and educational partners collaborate, all in hopes of helping them teach in the most successful way possible. It is necessary, then, to research both contemporary learning theory and popular education movements, such as Constructivism and 21st Century Learning, to understand in what direction educators are being encouraged to teach. It is also necessary to give attention to the new tools at hand, mobile technology, as they pertain to the 21st century classroom. Teachers are expected to learn how to use and teach with these tools, so a review of adult learning, or andragogy, is necessary as well. The methods by which teachers are taught to implement technology vary from school district to school district, so I review how new teachers are taught within pre-service courses as well as how existing teachers are taught through professional development. Finally, I bring the review back to one of the main stakeholders in my field of education: the art museum. I review how art education has adapted to technology integration, including how resources have developed over the years and acclimated to changes within the educational landscape. Overall, through this review of literature I gained a better understanding of why the shift towards mobile devices has occurred, how teachers are being prepared for utilizing them in the classroom, and how art museum staff keep up to date and relevant to these shifts in education. This review does not encompass all that I needed to know before conducting this study, but it informed my thinking as I approached two elementary classrooms in search of useful information for art museums.

CONSTRUCTIVISM

Constructivism is both a learning theory and an epistemology (Hein, 1991). Within constructivism, knowledge is constructed by the individual learner, "who imposes meaning on the world, rather than the meaning being imposed on the individual" (Karagiorgi & Symeou, 2005, p. 18), and there is "no knowledge independent of the meaning attributed to experience (constructed) by the learner" (Hein, 1991). Learning is a "personal and social construction of meaning" (Hein, 1991), indicating learners understand new knowledge within their own cultural background (Keengwe, Onchwari, & Agamba, 2013) and social situations. While the Platonic understanding of learning revolved around the recollection of knowledge, constructivism is influenced by several important educational theorists: John Dewey's (1938) work emphasized how each learner created knowledge through their own lived experience; Vygotsky's (1962, 1978) studies explored how social contexts inform learning; and finally Piaget's (1945) understanding of how knowledge schemata are developed individually. In Platonic views of epistemology and learning, knowledge exists and is organized outside the learner, which contrasts sharply with constructivism, where the learner creates knowledge within their individual experience. In constructivism, learners acquire and organize new information which "shapes and is shaped by prior schemata" or groups of similar experiences (Dexter, Anderson, & Becker, 2000, p. 224). These prior schemata are similarly shaped by the experiences and beliefs of the learner and the various contexts the learner exists in during knowledge construction. Knowing is determined by the meaning making process, rather than by being able to recite specific facts (Lee & Hung, 2012, p. 461).

George Hein (1991) is well known for his work in constructivism, specifically within the museum context. He outlines several principles of learning within constructivism. First, he points out "learning is an active process," where learners do

something and develop meaning out of it. People develop meaning and systems of meaning simultaneously, or "learn to learn as they learn" (Hein, 1991). This construction of meaning occurs in the learner's mind, activated by the language and social experiences used to communicate knowledge. Learning is both "active and social," and is thus contextual within our lives. Each learner organizes knowledge in their own way, and it takes time for learners to develop their systems of knowledge. Finally, learners must be motivated to learn, where motivation is considered "to include an understanding of ways in which the knowledge can be used" within a learner's life. Hein's principles of constructivism describe a learning theory and epistemology focused on the learner as the center of knowledge, which in many ways has translated into a shift in pedagogy. This view of the learner as the center of knowledge creation lends itself greatly to using technology in the classroom, as teachers shift from being the disseminators of knowledge to providing experiences, sometimes with mobile technology, from which students derive knowledge and understanding (Nicaise & Barnes, 1996).

Constructivism in the Classroom

Since constructivism insists learning is constructed by the learner, teacher-centered dissemination of knowledge is no longer appropriate (Nicaise & Barnes, 1996). In constructivism, knowledge is constructed by the learner, rather than absorbed from instruction (Dexter et al., 2000), thus methods of sharing knowledge, i.e., pedagogical philosophies, must be changed. Under this learning theory, educators serve as "facilitators of exploration and providers of experiences" (Prater, 2001, p. 12), rather than as experts of a subject. Removing educators from the expert role shifts students' inquiry to the center of the learning experience. In this student-centered model, educators should provide scaffolding, that is, building learning concepts atop one another in order to

effectively facilitate learning (Keengwe, et al., 2013). Schemata and student-centered learning lend themselves, constructivists argue, to utilizing thematic connections between subjects, rather than teaching a single subject in isolation. Learning environments should also include authentic experiences and "constructive and reflective thinking that intentionally creates collaboration and a conversational atmosphere" (Keengwe, et al., 2013, p. 889). Within the constructivist classroom, technology should serve as a "knowledge construction tool" and provide a 'phenomenarium,' a technology-based environment where students can manipulate, interact with, and learn from a specific phenomena, such as the physics of balance in creating a sculpture (Karagiorgi & Symeou, 2005, p. 20). Nicaise and Barnes (1996) argue this technology-based experience enables students to use "diverse and dynamic" resources that place them at the center of learning (p. 207). Learning objectives are not placed within the content domain, but rather are determined organically by the authentic tasks which reflect real-world scenarios. As Karagiorgi and Symeou (2005) explain, "The goal is not to teach a particular version of history, but to teach someone to think like a historian" (p. 19). Incorporating mobile technology and accompanying mobile applications may provide these types of authentic learning experiences, sometimes without students realizing they are learning. These types of learning experiences lend themselves to the adaptability of skills from one area of knowledge to another (Lee & Hung, 2012). Providing a wide array of methods from which to respond also "complements the learner's cultural background," encouraging them to participate rather than become discouraged (Keengwe, et al., p. 889). In many cases, this results in a focus on project-based learning, from which multiple subjects can be intertwined, larger concepts explored, and many different responses made possible.

Constructivist Teachers and Computers

Students today are considered digital natives, a generation regarded as the first to have ubiquitous access to technology, who consequently also prefer student-centered learning and collaborative projects (Keengwe & Georgina, 2013). This familiarity with technology and inclusion of constructivism in the classroom means teachers must alter their own considerations about how their students learn, where technology should fit into their classroom (Keengwe & Georgina, 2013), and how to adjust their pedagogy accordingly. In their study, Dexter, Anderson, and Becker (2000) utilized constructivism as a model from which to interpret their teachers' learning and how it relates to using computers in their classroom. The study, "Teachers' Views of Computers as Catalysts for Change in Their Teaching Practice," asked educators to evaluate their perception of how computers impacted their teaching practice. The researchers found that these classroom teachers needed to construct their understanding about which instructional methods created the results they wanted for their students and their classroom. As learners themselves, teachers needed to determine what including technology in their classroom looked like, and how in doing so to still meet their classroom goals. The study also found that not only do educators who practice constructivist techniques in their classrooms integrate computers in a substantial way, but also the educators themselves learn in a constructivist manner how to implement technology. The importance of time as a factor in this pedagogical shift is essential, as educators construct their own understanding of what works for their curricular and classroom needs. The process of shifting pedagogy to include constructivist techniques and technology into the classroom is not an immediate change, but the correlation between the two shows promise for teaching digital natives.

Studies demonstrate a strong connection between a teacher's association with constructivist techniques and the effectiveness of how computers are integrated in the

classroom (Eteolkeous, 2007). Those educators who utilize constructivist and student-centered teaching practices tend to incorporate computers more substantially and in a way that is more "intellectually fruitful" (p. 672). Educators who combine constructivist techniques and technology should also recognize that technology should not drive instruction, but visa versa (Keengwe & Georgina, 2013). Determining exactly what substantial and intellectually fruitful methods of technology implementation are necessary in the classroom is a complicated issue, so for this study I borrowed the framework of 21st century learning in order to better understand the trends of education today.

21ST CENTURY LEARNING

21st century learning is a term encompassing a broad movement embracing both constructivism and technology as a means of changing public education, though an agreed upon purpose is hard to find. For this study, the purpose of 21st century learning aligns with that of the Partnership for 21st Century Learning (P21), which states these changes are necessary in order to prepare students for the global workforce (P21, 2015). P21 is a collaboration developed by the National Education Association (NEA) and top education and technology executives. It is supported by the Department of Education as a response to No Child Left Behind legislation, a 2001 bill with a renewed focus on standardized testing with public school funding allocation at risk. Considering these contributors, a combination of economic and political factors clearly impacted the group's mission. Even so, with pressure to resolve low test scores and concerns over future economic impacts, it is worth examining how this version of 21st century learning aims to change today's educational field.

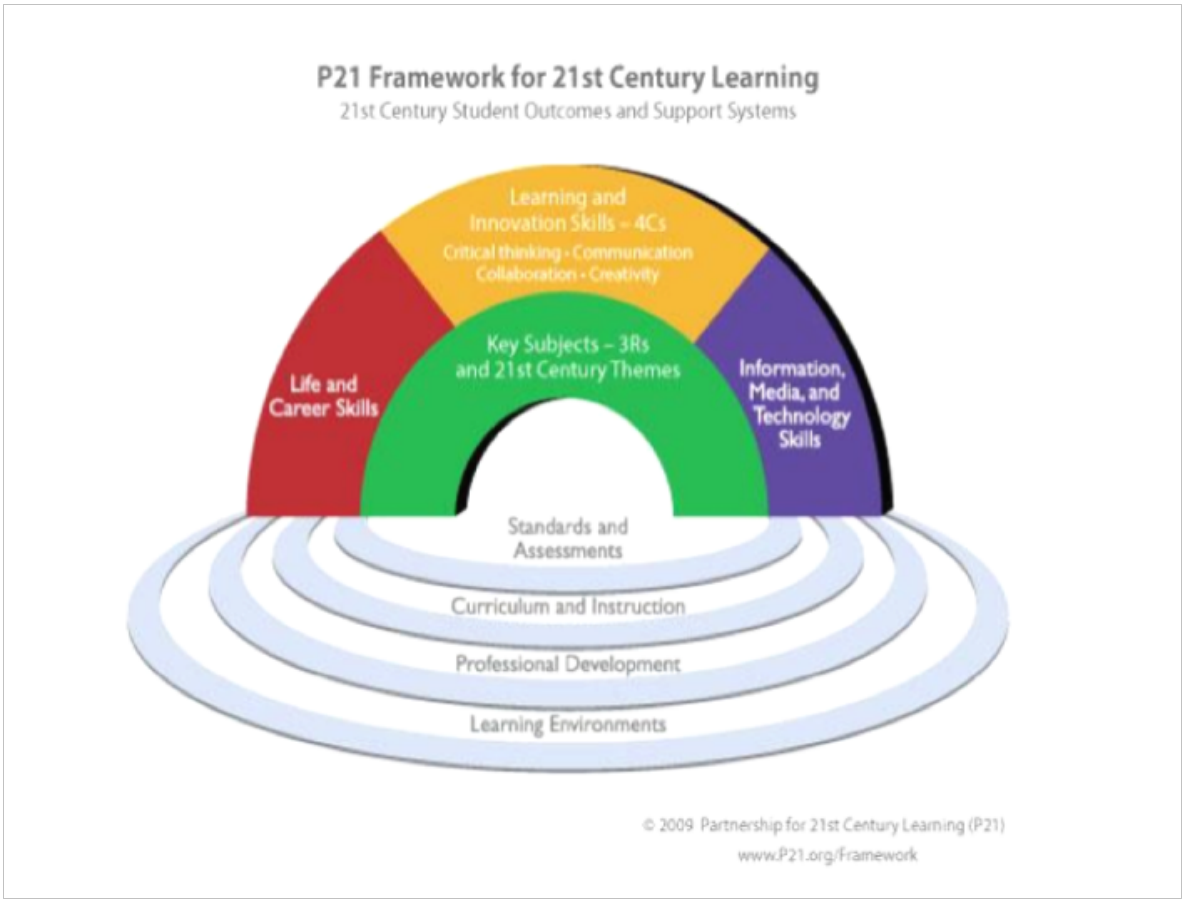

Figure 1: P21 Framework for 21st Century Learning (2009)

Described as a representation of the knowledge, skills, and expertise needed to "succeed in work and life in the 21st century," the framework developed by the Partnership for 21st Century Learning organization (Figure 1) illustrates what they define as the ideal student outcomes and support systems needed for student success (P21, p. 2, 2015). The Partnership defines student success as mastery in work and life, prioritizing the potential of students to compete in the global economy. Within P21's Framework, 21st century learning emphasizes the Partnership's ideal student learning outcomes, including deep understanding of life and career skills, core subjects, critical thinking,

communication, collaboration, creativity, along with a blend of information, media, and technology skills, as seen in the rainbow in Figure 1 (P21, 2015). These focuses call for drastic changes in how content is taught and how educators are prepared, from an emphasis on educator professional development to constructivist methods to so-called "21st century learning environments" (P21, 2015, p.1), represented by the ripples at the base of the rainbow in Figure 1.

The P21 framework defines key subjects, such as English, world languages, arts, history, and science, and connects them with interdisciplinary themes, such as global awareness and civic literacy, in order for students to understand content at high levels (P21, 2015). Learning and innovation skills, such as creativity, critical thinking, communication, and collaboration, are essential skills needed to address specifically the "more and more complex life and work environments in the 21st century" (P21, p. 3, 2015). Teachers should demonstrate and develop students' information, media, and ICT (information, communications, and technology) literacy, not only by integrating technology into classroom practices, but also by developing curriculum that requires students to critically think about the information they receive online. Essential life and career skills include flexibility, initiative, social and cross-cultural skills, productivity, and leadership. Combining content with interdisciplinary themes, the P21 framework aims to develop knowledge in a way where students construct their understanding of multiple subjects at once, while learning to work collaboratively.

While not specifically supported by P21's framework, a similar push for this intersectional understanding of content areas has come in the form of several education movements: Science, Technology, Engineering, and Math (STEM), Science, Technology, Engineering, Arts, and Math (STEAM), and Arts Integration (AI) (Riley, 2013). All three methods rely on the integration of content areas, though they vary slightly. STEM

focused education depends specifically on teaching skills in two or more of the STEM content areas, and "the means to connect these skills through the core processes of interpretation, communication, analysis, and synthesis" (Riley, 2013). The STEAM approach incorporates the arts into learning that is complex in both skill and process, and requires deep thinking and problem solving (Riley, 2013). Finally, Arts Integration is an approach "through which content standards are taught and assessed equitably in and through the arts" (Riley, 2014). While each of these approaches are geared towards blurring the distinctions between content areas in efforts to create deeper learning, each require multiple access points to ensure authentic learning (Riley, 2013). Additionally, teachers must be prepared to develop lessons "with a lens of focused purpose" (Riley, 2013). This type of lesson development does not occur without intent and support of teachers. In fact, P21 outlines a variety of necessary support factors, many identified to develop teacher's skills and pedagogy.

In order for students to achieve these outcomes, the framework proposes several critical systems necessary to ensure success. First, the learning environment for the 21st century should lend itself to project-based learning, extending beyond the classroom through online involvement, and "allow[ing] equitable access to quality learning tools, technologies, and resources" (P21, p. 9). This learning environment differs greatly from the classroom of years past, resembling more of a flipped classroom, where students learn content through websites and videos at home and complete homework in the classroom, thus utilizing technology to extend the classroom beyond its walls. This emphasis on using technology at home may exacerbate socioeconomic gaps between those students with technology at home and those without. The framework identifies professional development as an essential tool for classroom educators, including support for integrating 21st century skills into their classroom and sustainable sharing communities.

Discussed in further detail later in this literature review, one of the largest criticisms of technology integration today is the lack of support for classroom educators looking to implement technology in their classroom (Eteokleous, 2007; Levin & Schrum, 2013). Professional development may assist in resolving some of these issues, but would also require more time from teachers outside their regular classroom duties. This professional development should, according to P21, address the necessary adaptation of curriculum to incorporate technology effectively. Curriculum should provide opportunities for students to develop their 21st century skills, while integrating community resources, such as library and museum publications, into the classroom. The utilization of these types of resources underlines the necessity for studies such as this, where the use of museum resources with mobile technology in the classroom is central. The standards and assessments used within 21st century learning should focus on deep understanding, rather than rote memorization, and should allow for multiple means of response and "a balance of technology-enhanced, formative, and summative assessments" to measure mastery of 21st century skills (P21, 2015, p. 8). Technology inclusion is expected within the 21st century classroom, as is training for teachers to develop the skills necessary to implement it, though the degree to which educators are supported in this implementation is questioned (Eteokleous, 2007; Levin & Schrum, 2013). A common means of integrating technology into schools is the introduction of mobile devices into the classroom.

MOBILE TECHNOLOGY

In many K-12 contemporary school districts, investment in mobile technology is occurring rapidly (Benton, 2012). While computer labs are present in many schools, the stationary nature of desktop computers and need for scheduling their use make them less convenient for 21st century learning. Including technology that can support the

immediacy of the classroom is favorable. Popular options for mobile technology in the classroom include Chromebooks, which are Internet capable, portable personal computers at an accessible price; and iPads which are pricey Internet capable tablets with a touch screen (Marcinek, 2014). My thesis investigated the use of iPads in particular because of the need for an increase in research exploring the use of iPads in the classroom (Benton, 2012). iPads are handheld, portable tablets, which students can use to access applications or online tools for learning. The devices can be downloaded with the educational applications or other online resources of the teacher's choosing. Whether using Chromebooks or iPads, funding generally determines how many devices are available to students and teachers. Implementation models include one-to-one, BYOD (or Bring Your Own Device), and class carts. One-to-one programs are deployed in schools where the school provides a device for each individual student to use throughout the school year. BYOD programs ask parents to provide a device for students to use in school. A more frugal approach is the class cart, where devices are stored in a portable rolling cart, and teachers can check out enough devices for each individual student to use one. These class sets are common among schools because it allows teachers to request them when necessary, and enable other classes to use them when they do not. There is little research specifically addressing the methods by which technology is implemented, and how this affects an educator's use of it as an instructional tool (Benton, 2012). Additionally, few studies were found that addressed whether one implementation model is favorable over another, but some research has been done concerning student use of iPads in the classroom. Fisher, Lucas, and Galstyan (2013) show how the iPad can be used in the classroom to transform the learning space.

Fisher, et al.'s (2013) study focused primarily on characterizing students' learning space, for example their physical space while learning and the interactions students make

with those around them. The study focused on how the learning space was affected when students used an iPad, and found that the "size, portability, versatility, and tactile nature of the iPad" transformed the space in which students worked (p. 176). Whereas those students working with laptop computers tended to rarely share their learning with other students, those using iPads were more likely to show and share what they were learning. By sharing what they had learned, students were also repeating the information again, further aiding their understanding of the concepts at hand. Key to the effectiveness of the device was the iPad's capability to serve multiple students simultaneously as a means to view, discuss, and interact both with one another and with the device. The device enabled educators to include multimedia content into lectures as well as the students' discussions. The study also found students on iPads less likely to be off task, versus those using laptop computers. While there is little research involving the direct observation of iPad usage in the classroom, this study illustrates positive trends towards students utilizing the device as a learning tool during class time.

While many of today's students are digital natives, not all of today's teachers share the students' fluidity and confidence with technology, let alone mobile devices. Many school districts are eager to hop on the mobile bandwagon, though, and often fail to include the input of classroom teachers in the acquisition or implementation process. In asking teachers to utilize new technologies into their classrooms, districts must first consider how adults learn, then provide the necessary opportunity for that learning to occur. Using Malcolm Knowles' and colleagues (1990, 1998) characteristics of adult learners, I review andragogy in order to better understand how to teach teachers new classroom tools. Then, I detail what technology integration means for teachers in terms of good practice, development opportunities, and how implementation is currently measured in today's 21st century classroom.

ANDRAGOGY

In order to understand how educators implement mobile technologies into their curriculum, how adults learn must be understood. Malcolm Knowles (1990) is largely attributed for coining the phrase andragogy, encompassing the study of adult learning. He produced several seminal works (Knowles, 1990; Knowles, Holton, & Swanson, 1998) outlining characteristics and principles of andragogy. Throughout his works, Knowles developed several lists of assumptions or principles about adult learners, which have been studied, dissected, and expanded (Chametzky, 2014; McGrath, 2009; Rogers, 1996). To better understand adult learners, a discussion of Knowles' six principles of andragogy and the theories they have fostered is necessary.

The first principle of andragogy to consider is the adult learner's need to know the why, what, and how of their learning experience (Knowles, Holton, & Swanson, 1998). Unlike children who will learn something because they are told to, adults must know "why they need to learn something before undertaking learning it" (p. 64). They must also understand what they are learning and "the reason why they have to learn certain material" (McGrath, 2009, p. 102). Chametzky (2014) adds that adult learners must feel a "self-management of learning" (p. 814), where adult students have some type of control over the methods, means, and reasons behind learning material. In the example of training classroom educators in using mobile technology, a trainer should make a clear connection between the technological content at hand and the impact it could have in the classroom, the connections to 21st century learning, and how to address technological learning standards.

The second principle of andragogy explains that educators must consider the "self-concept of the learner" (Knowles, Holton, & Swanson, 1998, p. 3), including their desires to be autonomous and self-directing in what they learn, and their perceptions of

education from the past. Adult learners expect to have the freedom to respond to material in a variety of ways, including the option to choose how to respond. Adults have their own perceptions of learning, and as such an adult entering "an activity labeled 'education' [or] 'training'" is likely to "hark back to their condition in their previous school experience" (Knowles, Holton, Swanson, 1998, p. 65). Knowles goes on to explain there are many aspects to an adult learner's self-concept, including their personal learning style, previous experience in a subject, social orientation, previous learning socialization, and perceived locus of control, many of which are addressed in greater detail through Knowles' other principles. McGrath (2009) also addresses the "learner's concept of themselves" in terms of self-confidence in the classroom (p. 102). Rogers (1996) expands on this self-concept in terms of self-horizons, imaginary limits the learner possesses, which dictate "the sort of material that they can or cannot master" (p. 68). Identifying adult learners as people with self-identified learning preferences and opinions is essential to consider when discussing adult learners.

Knowles, et al. (1998) states the third principle of andragogy is relying the "richest resource for learning" in the adult classroom, which is the adult learner's experiences (p. 66). In some cases, these experiences are learning opportunities that can contribute to the subject matter at hand, which "can be harnessed into the world of the class to the enrichment of the whole group" (Rogers, 1996, p. 64), while in other cases the emotional remnants of the experiences may be less educationally beneficial. Events in learners' adult lives have resulted in "a set of values, established prejudices and attitudes," argues Rogers (1996), in which adult students "have a great deal of emotional investment" (p. 62), either positively or negatively. The impact of these experiences may "create a wider range of individual differences" between learners, in addition to providing "biases that can inhibit or shape new learning" (p. 139). Knowles (1990)

suggests that adults use past experiences to "create their sense of self-identity," so teachers of adult learners should be cautious in how they react or present the experiences shared (Rogers, 1996). Both Chametzky (2014) and McGrath (2009) mention adult students' life experiences as essential in aiding learning, with McGrath explaining the "student has a bank of experience accumulated over their lifetime and that they would like to apply this 'experience' in the classroom so that they can understand material that is being discussed in the session" (p. 103). In some cases, previous learning experiences must be unlearned, which can occur as often as learning itself (Rogers, 1996). Those teaching adult learners must thus be cautious in how the learners' experiences are used to teach, but should definitely include them as a means of teaching adults.

The fourth principle of adult learning revolves around learners' readiness to learn. Knowles, et al. (1998) distinguish between this and their motivations for learning, whereas other theorists (Chametzky, 2014; Rogers, 1998) combine the two. For Knowles, Holton, and Swanson, however, an adult learner's readiness considers whether the subject is life-related, in that they need to know it in order to use it in real-life situations. This contextualization of learning in the adult learner's professional, personal, and/or social life outside of the classroom mirrors the constructivist notions that knowledge should be context bound and how the individual must "make personal meaning of their learning experiences" (Knowles, Holton, & Swanson, 1998, p. 142).

Knowles' fifth principle states adult learners hold a life-centered orientation towards subjects, which means they approach learning through tasks and problems that resemble what they would experience in their daily lives. If a subject will lend itself to a problem learners could confront in a life situation, then they are more motivated to learn, Knowles, Holton, and Swanson (1998) assert. This principle reads similarly to the previous principle, which he differentiates by describing the experiential learning that

should accompany a life-centered orientation. "Experiential learning," which encompasses realistic learning opportunities by imitating real-world situations, offers a greater likelihood of the transfer of learning from classroom to performance (Knowles, Holton, & Swanson, 1998, p. 148). This notion of the transfer of learning will be addressed again later in this literature review, in reference to educators learning technological skills in training and implementing them into the classroom. Chametzky's (2014) studies of andragogy in online learning also trumpet "practical, real-world" solutions as a theme in adult learning (p. 814).

The final principle of andragogy, according to Knowles' research (Knowles, 1990; Knowles, Holton, & Swanson, 1998), is the power of the adult's motivation to learn, which is driven by intrinsic value and optimism for personal pay offs. While external factors, such as better jobs or higher salaries, are present, Knowles states, "the most potent motivators are internal pressures (the desire for increased job satisfaction, self-esteem, quality of life, and the like)" (p. 68). The research is likely addressing adult learners who are voluntarily enrolled in classes, such as college courses or certification programs (Knowles, Holton, & Swanson, 1998). Chametzky (2014) brings attention to the potential empowerment of learners who have taken control of their learning by enrolling in courses, while McGrath (2009) points out that adult students are likely motivated by internal and external factors.

Knowles' work (1984) in andragogy when studying adults and technology is limited to personal computer training, though in many ways mirrors the principles of andragogy. When teaching adults about using computers, Knowles states the educator should be explicit in explaining why a specific item is being taught, and thus should be learned. Instruction should revolve around tasks the learners are likely to encounter in real life, and should also take into account the wide range of learners and their

experiences. In teaching adults new technology, Knowles (1984) points out, adults should have the autonomy to discover knowledge on their own, but should be given guidance when needed.

TECHNOLOGY IMPLEMENTATION

Taking these principles of andragogy into consideration, there are many additional factors at play when educators are asked to learn a new technology for use in their classroom. Hosman and Cvetanoska (2013) identify a problematic attitude in the field of education, "that the mere provision of technology will lead to its adoption and implementation into teachers' pedagogy" (p. 29). Implementing technology effectively suggests more than a teacher learning to use a device. An educator must not only have a strong grasp on the technology, but also fit it appropriately into their classroom management, culture, instructional skills, and curriculum (Dexter, Anderson, & Becker, 2000). Introducing technology into these aspects of a teacher's teaching style requires an adaptation process, which could take years-long support (Hosman & Cvetanoska, 2013, p. 29). Both Hosman and Cvetanoska (2013) and Wallinger (1997) emphasize the importance of including teachers in the decision-making process, in order to address their concerns and questions from the start of planning and implementation. Studies agree utilizing teachers as critical stakeholders and contributors to decision making when implementing new technology is essential to successful technology implementation (Benton, 2012; Dexter, Anderson, & Becker, 2000; Eteokleous, 2007; Hosman & Cvetanoska, 2013; Wallinger, 1997).

A single definition of technology integration, or technology adoption, is difficult to find, as each study defines it with a different umbrella of terms and responsibilities, and different stakeholders prioritize different aspects. Some define it by its integration

within “the daily routines, work, and management of schools” (Technology in Schools Task Force, 2003), which isolates the necessity of technology use to primarily administrative planning or research purposes. This does not sufficiently describe the depth or scale technology adoption encompasses. As Dexter, et al, (2000) pointed out, a teacher possesses a variety of personal and professional contexts into which they must fit new technology. For the purposes of this study, I use technology integration and technology adoption synonymously. Within the contexts of this study, technology integration or adoption means:

> the use of technological tools in the classroom with an understanding of its relationship to pedagogy. That is, technology integration is part of the pedagogical process and instructional delivery of a set curriculum; technology does not cause learning, rather learning occurs due to effective teachers. (Koch, Heo, & Kush 2012, p. 2)

The inclusion of technology is thus a piece of the pedagogical puzzle. Technology does not define learning, but functions as a tool at the disposal of an effective educator. Time is also a crucial piece of this puzzle, since this type of drastic shift to teaching practices requires developmental time. Dexter, et al. (2000) recommend expecting to see “change in terms of years, not months” (p. 222). This relationship between technology, pedagogy, and time must be fostered through pre-service learning or through professional development opportunities. The next section of this literature review offers a survey of how technology implementation in curriculum is evaluated. Understanding the evaluation tools used helped me understand what characteristics and skills are known as ideal practice for teachers.

Technology Implementation Evaluation

Describing the journey an educator takes as they learn and integrate technology tools in their classroom requires a variety of tools that address the wide array of

developed skills and behaviors. This process an educator goes through may be more informal than the evaluation tools used here, though an understanding of what an ideal technology adopter might look like and a framework to articulate where within an educator's knowledge technology fits was useful within this thesis.

The International Society for Technology in Education (ISTE) provides an annual list of National Educational Technology Standards (NETS) for teachers. In 2008, the NETS focused on developing teacher behaviors to effectively integrate technology. The 2008 NETS outlined a continuum of four phases: (a.) teachers new to using technology in classroom instruction, (b.) teachers developing effective teaching behaviors, (c.) teachers proficient in effective teaching behaviors, and (d.) teachers who transform their teaching behaviors to adapt and apply technology "in ways that fundamentally change teaching and learning" (International Society for Technology in Education, 2008). These standards aided teachers' understanding for what and how to develop behaviors by which they could measure their effectiveness in technology integration. As teachers develop specific behaviors for when and how to use technology in their pedagogy, the use of technology transforms both teaching and learning.

Seven years later, the expectation from the NETS is for educators to be proficient in technology integration. The 2015 NETS outline five standards: (a.) facilitate and inspire student learning and creativity, (b.) design and develop digital age learning experiences and assessments, (c.) model digital age work and learning, (d.) promote and model digital citizenship and responsibility, and (e.) engage in professional growth and leadership (ISTE, 2015). In order for educators to achieve success by today's standards, they must already be at the fourth level of the technology integration continuum. This is, however, not the reality for the vast majority of teachers. In order to evaluate the growth of classroom educators' understandings of incorporating technology, some rely upon

what they already know, and measure their use of technology as a part of, and in relation to, that knowledge (Koehler & Cain, 2009; Koehler, Mishra, & Cain, 2013; Mishra & Koehler, 2006). This method is more clearly defined as TPACK, or technological pedagogical and content knowledge (Koehler & Cain, 2009; Koehler, Mishra, & Cain, 2013; Mishra & Koehler, 2006).

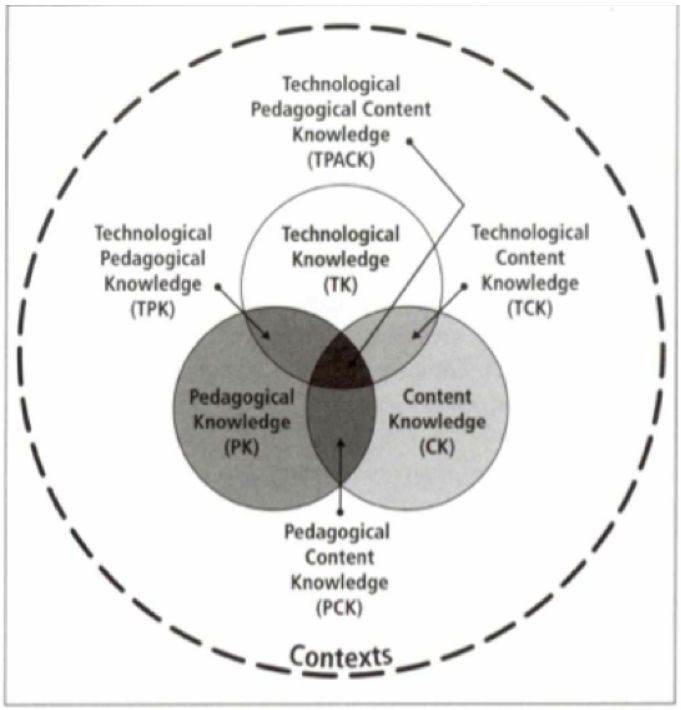

Figure 2: The TPACK Framework and Its Knowledge Components (Koehler, Mishra, & Cain, 2013)

Many mobile learning studies utilize TPACK, an evolution of Lee Shulman's (1986, 1987) pedagogical content knowledge theory, which states educators have sets of knowledge, i.e., pedagogy and subject content, and the intersection of these sets of knowledge reflect effective teaching. The evolution of Shulman's (1986, 1987) theory was published by Mishra and Koehler (2006), now adjusted to include technology

knowledge, an area of knowledge many classroom educators are expanding into with the rise of mobile technology. While an educator possesses knowledge about pedagogy, content, and technology, Koehler, Mishra, and Cain (2013) state, it is the areas in which they intersect that are:

> the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies, pedagogical techniques that use technologies in constructive ways that teach content, knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face, knowledge of students' prior knowledge and theories of epistemology, and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones. (p. 16)

This approach focuses on the interaction between student and teacher, including the application of a teacher's knowledge to a student within the "unique circumstances or context within their classrooms" (Koehler, et al., 2013) to understand technology integration. By treating knowledge as something the teacher possesses and must communicate, Koehler, et al. (2013) state the integration of all three knowledge spaces illustrates an expert teacher, who would "bring TPACK into play any time they teach" (p. 17) with technology. This definition of an expert teacher aligns with the fourth phase of the ISTE continuum. Since there is no single means to evaluate technology use in the classroom, different stakeholders evaluate effective use differently.

Teaching behaviors and technical knowledge in relation to content and pedagogy appear to be helpful means to evaluate educators' use of technology. Each of these elements appears as part of a continuum by which teachers learn new technologies, and also a continuum by which they integrate the technology within their pedagogy and subject content. If these are the desired outcomes, how then is the field of education teaching technology integration to today's teachers?

Pre-Service Educators and Technology Integration

A brief investigation into the studies concerning pre-service teachers and technology integration contributed to my understanding of the practices and skills higher education deems beneficial to incoming teachers. Some studies (Koch, Heo, & Kush, 2012; Iding & Nordbotten, 2001; Sutton, 2011) concerning technology integration utilized specifically pre-service educators. This is likely because pre-service educators are just developing their teaching philosophies and techniques. Koch, Heo, and Kush's 2012 study surveyed students in a pre-service program, which aimed to increase technology integration among its student teachers. The survey asked students to rate their perceived ability to incorporate technology into classroom lessons before and after their student teaching. Those who attended the program reported they felt more adept after their student teaching at both "a) organizing reflective journals, and b) developing technology rich environments that allowed their students to become more active participants in their own learning" (p. 9). This relationship between reflexivity and technology is also noted in Dexter, et al (2000). In both examples, educators who practiced reflexivity in their teaching also found technology useful to create a more student-centered practice. Participants in Koch, et al.'s (2012) study reported their coursework left them feeling prepared, but their "skills increased following real world experiences that allowed them to see direct results of their instruction through the learning of their students" (p. 9). This study also showed that pre-service teachers who perceived the high schools they previously attended as students to be well integrated with technology were also more comfortable integrating technology into their own teaching, due to the modeling of good practice. Using pre-service educators and their personal experiences as an example, this study outlines the importance of reflexivity, hands-on experience, and modeling in technology integration. The research concerning technology

integration that utilizes pre-service teachers outlines effective methods, curriculum, and planning needed to train incoming educators to be prepared to successfully integrate technology. While this may be effective for educators entering the field, there are many who have already been teaching for many years or come into the teaching profession through non-traditional routes. For those teachers, the professional development provided by their school districts are the most immediate training they receive concerning technology integration in their classrooms.

Professional Development for Technology Integration

Workshop-style professional development is most commonly included as a part of district-wide technology deployment, though several studies surveyed question the practical usefulness of these workshops for classroom educators (Benton, 2012; Eteokleous, 2007; Levin & Schrum, 2013). Generally, the workshops introduce teachers to the hardware and software of the device and outline existing campus resources, but rarely address the concrete curriculum adaptation many studies call for (Baylor & Ritchie, 2002; Benton, 2012). Beyond this initial introduction to the technology, little support is provided for follow-up questions, maintenance, or curricular adaptation.

In Benton's 2012 case study, she investigated classroom teachers utilizing the iPad as an instructional tool. Her educators attended a professional development workshop provided by their school to learn the basic functions of the iPad, but school administrators left the responsibility of integrating the devices into curricula to the teachers themselves. Despite the availability of class sets of iPads, many teachers were intimidated by them, so much so the devices were rarely used in the classroom. Some teachers in the study used them to collaborate during curriculum planning, while using one another for technological support. When used in the classroom, teachers found

themselves relying on their students as the best resource for troubleshooting. While educators in Benton's (2012) study failed to demonstrate how the iPad had influenced their pedagogy or teaching, every participant acknowledged the positive impact the devices had on student engagement. Given what Knowles (1990) states about adult learners, it is relevant to point out that the educators in Benton's study were not given information to make learning the iPad valuable to their professional or personal lives; they were only given standard operating instruction. Connecting the device to implementation of curriculum may have accomplished just that. The added bonus of student engagement would also have been a motivating factor for classroom educators. However, without being provided this additional information during training, the educators studied (Benton, 2012) did not show how the iPad changed their pedagogy. The success of or failure to implement or reflect change does not lie on the teacher specifically, but rather is a result of the implementation plan in place. The process of implementation is commonly a district-wide or at least school-wide project, and many complex characteristics can determine success or failure in technology adoption. School districts and administrators must work alongside classroom educators to ensure mutual success, and some research (Benton, 2012; Etekleous, 2007; Levin & Schrum, 2013) has been done to illuminate specific traits of successful integration.

While each school district has their own set of circumstances, research such as that by Etekleous (2007) seeks to describe factors, both positive and negative, to technology integration in schools. Positive traits to ensure a strong integration of technology included, "a positive school environment, adequate school support, adequate technology resources,…time for planning, teacher coaching,...and sustained funding for technology" (p. 672). Negative factors include a lack of a clear vision for implementation, educator anxiety towards devices, and an absence of educator input.

Eteokleous (2007) studied computer-based curriculum integration in Greek schools, and found that "continuous teacher training and adequate professional development" were the most important factors in successful technology integration (p. 672). It was not enough for educators to be shown how to use the computer; they instead needed to be taught how to integrate the computer into their curriculum and be given opportunity to continue to develop their skills.

Just as computers were implemented into classrooms decades ago, currently teachers around the world are beginning to implement mobile technology into their classrooms. The way school districts integrate these devices varies from one to another, though several best practices for successful technological integration have been corroborated by research (Benton, 2012; Etekleous, 2007; ISTE, 2008; Koch, Heo, & Kush, 2012; Levin & Schrum, 2013). First, successful technological integration should be defined as the use of a technological device in the "pedagogical process and instructional delivery of a set curriculum" by an educator (Koch, Heo, & Kush, 2012, p. 2). This research suggests giving pre-service educators experience during student teaching enables a beneficial experience and reflection period. Next, educators must be given the opportunity to learn how to adapt their curriculum to integrate technology optimally, in addition to learning practical technological skills through ongoing professional development (Eteokleous, 2007; Levin & Schrum, 2013; ISTE, 2008). Finally, the nature of mobile technology lends itself towards a fundamental pedagogical shift for classroom educators, from a teacher-centric classroom to one that is student-centered (Benton, 2012).

Art Education and Technology Adoption

While there is still little research concerning iPad use in the classroom, I found during my search that there was even less investigative material addressing the art classroom specifically. Some studies investigated mobile technology in relation to learning spaces (Fisher, Lucas, & Galstyan, 2013), others sought to learn how teachers use it as a teaching tool (Benton, 2012), but none that I found addressed a hands-on study of a mobile device in an art classroom. One study investigated iPad art applications and evaluated them for potential classroom use. Katz-Buonincontro and Foster (2013) studied the most popular iPad art applications available in the Apple App Store, an online store where users can purchase applications for Apple devices. The researchers analyzed popular art applications were analyzed through an array of characteristics, from psychological learning principles (communication, reflection, feedback) to pedagogical voice (adaptable design for social constructivist teaching), to determine whether or not the applications would be credible in the classroom. The pair investigated sixteen different applications, chosen by selecting the most downloaded applications from the search terms *art museum, art,* and *painting*. Throughout these sixteen applications, the authors used content analysis to determine which and how many applications were appropriate for classroom curriculum. While fifteen of the sixteen applications engaged the voice of the teacher in either pedagogy, academic content, or pedagogical content knowledge, only four demonstrated the opportunity for students to create digital artwork. Researchers found that many of the applications relied on the "click and view approach" to integration (Katz-Buonincontro & Foster, 2013, p. 57), encouraging sharing and commenting on artworks but facilitating little "active reflection about the paintings" (Katz-Buonincontro & Foster, 2013, p. 57). This study found a lack of substantive art content, though this may be due to the sample of art applications chosen. Rather than

relying on the popular and most downloaded applications, a set of more educational and comprehensive applications may have been found by using recommendations from educational technology sites such as Edutopia. App Store visitors seek mobile applications for many purposes; not all those downloading art-based applications are doing so for educational purposes. An investigation of applications recommended by educational advisors and developed for educational purposes may provide a more positive outlook on mobile applications for the art classroom. Part of my study will address the quality of content in mobile applications as it applies to elementary curriculum, how educators can use them in classrooms with iPads, and what art museums can learn from how these resources contribute to curriculum.

While some mobile art applications are developed independently by third party developers (such as *Foolproof Art Studio* developed by Studio Mee) others are created in consultation with museums under the umbrella of the museum's digital strategy, such as *MoMA Art Lab* (MoMA, 2013). Rather than hiring in-house developers, museums contract companies to develop applications that will be distributed under the museum's name. Some museums create applications to supplement a visit to the museum, such as the Rijksmuseum's self-titled application that provides multimedia tours of its space (Rijksmuseum, 2013), while other applications blend an in-person visit with a digital tour of the museum, such as the Cleveland Museum of Art's award-winning ARTLENS, a robust application providing information and images of artworks while providing additional perks for those in the museum (Cleveland Museum of Art, 2014). Whether for special exhibitions or permanent collections, large museums are producing mobile applications to connect with the smartphone-carrying audience.

With the museum and technology worlds working together more than ever, several professional groups and conferences have developed, such as the Museums and

the Web conference. This conference is held annually to celebrate the outstanding digital experiences developed for museums, competing for Best of the Web in categories including best in education, mobile, digital exhibition, and social media (Museums and the Web, 2014). Each year twelve digital applications or websites are selected by fellow museum technology professionals to represent the Best of the Web. A glance at the 2014 winners features five art museums, including the Reynolda House Museum of American Art, the Cleveland Museum of Art, and The Dallas Museum of Art (Museums and the Web, 2014). Art museums, especially large ones with the digital strategy budgets necessary to plan, test, implement, and maintain mobile applications, are already publishing impressive online materials for the public, including classroom educators. One aspect of my study focused on determining how educators access online materials, and in what ways resources are used in an educator's curriculum. Are classroom educators concerned with resources that supplement hands on work, that stand alone as a lesson, or a hybrid of both? Are museum applications by default reputable for classroom use? What curricular goals do online resources accomplish for classroom educators? With the high-quality of online materials being developed by art museums, this study looked to generate a clearer picture of how and why online art museum resources are used in elementary school classrooms.

A Brief History of Museum Resources for Teachers: 1900-2000

Since the early 1900s, art museums have developed resources for educators to use in the classroom as a means of sharing the museum's mission with a greater public (Eggemeyer, 2006). As commercial technology developed, so did museum resources. Slides were replaced by printed photographs when printing technology became more affordable, until CD-ROMs filled with images and games became more economically

feasible (West, 1998). As the Internet has become prominent, the digitization of images has become of primary importance, so anyone with an Internet connection can obtain high-quality images of art pieces. The evolution towards the Internet enabled educators around the world to access "the museum and all it has to offer" (Sayre & Wetterlund, 2002). Throughout this short history, the methods and types of information shared through these resources has evolved.

As museums developed more robust public programming in the early 1900s (Eggemeyer, 2006), education departments began developing educational resources specifically for teachers (West, 1998). Initially, museum resources were primarily slides of artworks and informational pamphlets on works from a museum's collection. By including contextual historical information about artworks, the museum assisted the classroom educator in teaching about the object's place in art history while promoting the museum's collections. Teachers borrowed image slides from museums, and used them to share a collection of images with an entire classroom of students at once. As well intentioned as the slide-lending program was, Berry (1998) acknowledges that broken slide projectors were a common barrier for classroom educators attempting to use the slides. As printing technology progressed and became less expensive, postcards and posters became more common, which also included contextual and historical information about the artist and artwork. These were helpful in the classroom as many students could view different artwork simultaneously, without worrying about whether technology would cooperate (Berry, 1998).

By the mid 1980s, computers in classrooms became more prevalent, and with it came the development of CD-ROM resources (West, 1998). By the early 1990s, these classroom resources were transferred to CD-ROMs, large enough to include images of artwork, geographic and chronological contextual information, games related to the

artworks, and loose connections to classroom curriculum (West, 1998). As plentiful as they were, many of these resources developed by museum educators lacked classroom educator input, thus resulting in few direct or in weak connections to current classroom curriculum (West, 1998). The late 1980s and early 1990s saw a resurgence within professional museum and art education organizations to collaborate with classroom teachers when developing classroom materials (American Alliance of Museums, 1984; Stone, 2001). In addition to materials to support on-site visits to the museum, such as pre- and post-field trip lessons, art museums also commonly offered teacher professional development workshops, which frequently included visual literacy training, stand-alone lesson plans that align with standards and objects in the museum's collection, and multimedia, from video footage of art objects to interviews with artists (Stone, 2001). With such a wide variety of resources available, interviews with my subjects in this study included inquiries regarding which, if any, of these resources participating classroom educators have used in the past.

In the mid-1990s, the Internet arrived in schools and many museums began to develop their first websites. Some believed the Web would be an opportunity to expand the reach of museum resources (West, 1998). With this opportunity to utilize the Web to widely distribute resources and the museum's mission, museum staff now had to face decisions concerning how to staff, fund, and implement online resources. Museum staff also had to determine whether to create these digital products in-house, collaborate between institutions, or hire out to creative firms. Directors could choose to work collaboratively with other institutions or creative agencies, or hire staff to manage online content. One of the more successful collaborative programs for teacher resources is ArtsConnectEd, an online database of arts resource for teachers, which found success by

combining the Walker Art Center and Minnesota Institute of Arts' needs for a database and the need for arts resources for Minnesota schools (Wetterlund, 2009).

Online Museum Resources for Teachers: 2000 to 2015

While many museum websites were limited to providing information for on-site visitors (West, 1998), ArtsConnectEd developed as an online database collaboration in 1998, between the Walker Art Center and the Minneapolis Institute of Arts, to connect classroom teachers with digitized teacher resources (Wetterlund, 2009). Early editions lacked usability, but the project gained traction when it was revised to include input from classroom educators (Wetterlund, 2009). The website provided a variety of electronic teaching materials, divided into an Art Gallery to search for specific pieces, a Classroom search for educational resources, a Library search for archival records, and a Games area for online activities. Mainly search-based, this online tool provided classroom teachers with a wealth of information, though few teachers were made aware of its existence. Funded largely through grants, the resource became even more successful by partnering with the Minnesota K-12 teaching community as testers, facilitators, and marketers. Not only was the project tested to ensure usability among classroom educators, but researchers also adopted a "train the trainer" model. This model provided the opportunity for a set of teachers to be trained on the software and then go back to their own districts and schools to teach others, who would then pass the software knowledge along further. This method of training empowered teachers to become leaders in their regions, while simultaneously marketing and increasing the number of teachers using the software. Accomplishing the digitization of both the Walker and the MIA's collections while also serving as an online tool for classroom educators, ArtsConnectEd serves as a prime example of a successful collaboration between museum institutions and classroom

educators, ensuring mutual success. I focus on this site as an example of what is possible with grant funding and collaboration, using technology as a powerful bridge between creators and users of online resources. It also serves as an example of the wide variety and depth of teacher resources possible with online technology in arts museums.

Websites and online resources clearly provide opportunities for arts museums, though determining exactly what course to take, whether this means finding funding or deciding how online endeavors fit the overall educational plan, has been a challenge. For example, initially, the primary need ArtsConnectEd served was for the institutions at hand to find an affordable means of digitizing their collection. Only later did the program expand to address school audiences. In the late 1990s and early 2000s, this approach to digitizing anything paper-based was indeed the focus of many institutions (West, 1998). In 1995, only 14% of Americans used the Internet (Fox & Rainie, 2014). By 2005, this number jumped to 66% (Fox & Rainie, 2014). With this vast increase in usage over only a ten year span, museum staff were eager to get their information online. Putting content on the Internet meant more people could access it, potentially increasing the size of the audience and providing resources to more teachers (Iding & Nordbotten, 2001). While the Internet provided the means for distributing more resources to more teachers, education departments needed to determine how they would use the tool, how it would be funded, and what ends it would serve. In order to gain a better understanding of how museum education departments adjusted to the demands of the Internet, I referred to the Museum-Ed Art Museum Education Programming survey (Wetterlund & Sayre, 2003, 2009).

In order to gain a better understanding of how education departments within museums have responded to the ubiquity of technology, I rely on the Museum-Ed Art Museum Education Programming survey, which was instituted in 2003 and is repeated

every five years. Museum-Ed, a professional online collaborative of museum education professionals, conducts the study with the purpose of surveying how museum education departments are serving their public, including the types of resources museum staff are developing. In 2003, 91% of responding museums provide some kind of art museum teacher training, over 50% had pre- and post-visit as well as other classroom materials for teachers, though only 54% of them offered the lessons and activities online (Sayre & Wetterlund, 2003). This established what is considered a normal offering for larger art museums. Between the two studies, though, it is important to note changes in the availability of technology. The iPhone was released by Apple in 2007, with subsequent reiterations featuring improved hardware and software released annually (Warren, 2014). By 2009 35% of American adults owned a smartphone. The iPad was not released until early 2010 (Kastrenakes, 2015), but the popularity of smartphones likely affected the 2009 survey. The Museum-Ed survey in 2009 included more institutions but found only 83% of responding museums offered teacher training (as opposed to 91% in 2003), more than half still provided pre- and post-visit materials, though the number providing other classroom materials dropped by 20%. Mixed within these numbers, however, is the expansion of other online resources, such as e-learning, online exhibits, and online interactives, and the use of social media, including blogs, podcasts, and Twitter and Facebook accounts. So, while the basic package of resources (pre- and post-visit materials and teacher resources) remained the same, additional online resources and avenues of communication developed. How these numbers continued to change remains to be seen. The iPad has been on the market for five years, and other tablets are earning popularity. Concurrently, museums are developing iPad applications for both special exhibitions and permanent collections. Museum-Ed is collecting data as I conduct this thesis.

While technology fostered the means by which teacher resources were shared, education reform determined much of the content. The passing of No Child Left Behind (NCLB) legislation in 2001 introduced strict testing requirements into schools seeking federal funding. Benchmarks for test scores were set for schools to pass, and much of the burden fell on classroom teachers, who were now responsible for producing students who could pass, some argue, poorly written multiple choice tests. Soon after, the United States established the Common Core, a set of unified math and language arts standards for states to agree on. The standards aimed to ensure a specific uniformity, so a student living in Illinois could move to California and continue learning the same curriculum. The standards would determine how a subject would be taught and what skills would be developed for each grade level. Many states adopted the Common Core, with all but eight states currently using both the math and language arts standards in schools (Common Core State Standards Initiative, 2015).

With school administrations and teachers buckling down to achieve high test scores, museum educators need to estabish, through strong curricular connections to standards, how their resources are beneficial to students. Schlageck (2010) reported even a generic school tour must be marketed differently in a post-NCLB education system. It must closely align with specific goals and standards for each class. Whatever the method, from online lesson plans to multimedia tablet applications, it is of primary importance that the "objectives and expected outcomes mirror academic standards, curricula requirements, and skill-building activities" of today's classrooms (Marable-Bunch, 2010, p. 10). With these pressures on museum staff to align programming with the classroom, an investigation into how and what classroom educators use in online resources is necessary.

CONCLUSION

This thesis study sought to fill the need for classroom-based research, to illuminate how online museum resources are used by everyday teachers. Art museum staff are working to evolve the resources they have developed for years. This study looked to provide two examples of how mobile technology is used to access these online materials in the classroom. There is no one-size-fits-all method of implementation, only the stories of educators who seek to share their experience in order to better inform the decisions of important stakeholders, like those in museums and schools. I now capture and analyze the stories of two such educators, who are the topic of the next chapter.

Chapter 3: Methodology

As explored at the beginning of Chapter 1, some educational stakeholders in the United States are eager to include technology in the classroom. Educational leaders are championing several different methods of improving public education, from a renewed focus on standards to an emphasis on developing 21st-century ready students. As a part of this, school administrators are being challenged to integrate new technology into classrooms. Mobile technology, in particular, is attracting attention due to its relative inexpense and ubiquitous nature outside the classroom. These innovative technological tools challenge traditional methods of pedagogy and create opportunity for educational partners to create resources for the classroom. Art museums are of special interest for my study, as art museum staff are equally challenged by current educational trends to sustain communication and provide new standard-driven classroom resources. As such, this research question guides my study:

In conducting a case study with one elementary school art specialist and one elementary level generalist classroom teacher, how do these teachers use mobile technology to integrate art museum resources into their curriculum and what can be drawn from this information that may assist art museums in providing substantive educational resources and programming for elementary school art instruction?

QUALITATIVE RESEARCH

A qualitative research method is necessary to answer this question because it requires a focus on the personal experience of the teachers. Rather than relying on some statistical analysis of qualitative data, I analyze data through "human perception and understanding" (Stake, 2010, p. 11) to learn what I want to know. Qualitative studies must not only rely on human experience, but also are specifically interpretive,

experiential, situational, and "personalistic" (Stake, 2010, p. 11). These experiences of participants and researcher interacting with one another serve as the main source of data. The interactions will take place in the field (the classroom) and are interpreted in the context of these specific teachers, in order to understand their world (Gillham, 2010). Additionally, the researcher seeks to understand the educators' point of view and interpretation (Pierce, 1996; Stake, 2010), a specifically qualitative characteristic.

CASE STUDY

In order to understand how teachers use mobile technology and art museum resources in their classrooms, and gain an understanding of both "the situation and meaning for those involved" (Merriam, 1998, p. 19), I needed to develop a case study. Case study traditionally seeks to provide an "in-depth description and analysis of a bounded system" (Merriam, 2014, p. 40), as studied "within its real world context" (Yin, 2014, p. 16). A case can revolve around an individual, group, or entire community, and a phenomenon within that population that a researcher desires to know more about (Gillham, 2010). My case includes two teachers, one generalist teacher and one art teacher, and their experience creating and conducting a lesson in their classroom using mobile technology and art museum resources. In order to understand this contemporary case, I studied the teachers in their real world context, their classrooms. I relied on description and my subjective interpretation of data (Gillham, 2010) to describe how these two teachers use mobile technology to deliver lessons that include art museum resources.

In order for this case to be studied, I needed two appropriate teachers who would be willing to participate. I chose to study one generalist classroom teacher and one art specialist in order to understand how educators with different content knowledge would

incorporate art museum resources into their curriculum. Participation criteria for each educator included agreeing to work with me and creating a lesson that includes museum resources and mobile technology, which I could then observe when taught. They did not need experience with museums or mobile technology. I also asked them to keep a journal, either audio or written, to provide context for their experience in selecting a museum resource. While each agreed to work with me, the degree to which I was a part of their process in creating the lesson varied.

ROLE OF RESEARCHER

The role of the researcher can vary greatly, usually dependent on the way a case is structured. Varying terminology is used to describe the extent to which a researcher observes or participates in the research they are conducting. The wide variety of involvement with which researchers can participate or observe a study is described as a continuum (Merriam, 2014; Yin, 2014). Some researchers are complete participants, meaning they are members of the group being studied while collecting data on the side (Merriam, 2014). In this role, the researcher would prioritize being a member of the group over their role as an observer. Next along the continuum is a participant observer, in which the researcher would act in their role as a participant over the needs of observing, though they still make time to observe. In contrast, a researcher who is defined as an observer as participant places importance on the collection of information over being part of the group. Many of those involved in teacher research fall between being a participant observer and observer participant, according to Merriam (2014), including what is called a collaborative partner. Collaborative partners participate on a different level than a static researcher, contributing and interacting with the participant being researched while not belonging to their community. A complete observer would lie on the

opposite end of the continuum from a complete participant, meaning the researcher would be hidden from the group being researched.

I take on two different places on this continuum throughout my study. For both teachers, I offered to provide technological assistance, training, hardware, and application recommendations in order to supplement each educator's content and pedagogical knowledge with my technical knowledge (Mishra & Koehler, 2006), though they accepted with varying degrees. As the researcher, I am always observing my interactions with the two teachers. With June, I am more involved with the development of the lesson and would be considered a collaborative partner. I also contributed to the formulation of her lesson by suggesting mobile applications she could use, while having a hands-on role in maintaining the iPads between classes. In the case of Jon, I would be defined more as an observer as participant, since he developed his lesson independent of my help and did not require or solicit my technological assistance during the lesson.

A common concern among qualitative researchers is how to manage the relationship with research subjects in order to limit bias and ensure truthfulness (Clandinin & Connelly, 2000; Merriam, 2014; Yin, 2014). Explanations concerning how this study exercises methods to remain honest and true appears in a later section, including discussion in the data section.

PARTICIPANTS

In qualitative research, selecting participants can be accomplished using several strategies, all of which are defined as purposeful (Patton, 2002) since the researcher has determined a set of criteria that participants must meet in order to be information-rich participants (Merriam, 2014). Much like the researcher's role of participation, subject selection strategies run along a continuum. One end is maximum variation, a strategy by

which a researcher selects a widely varying set of participants, in order to demonstrate contrasting instances (Merriam, 2014). An example of maximum variation may be selecting two different schools to participate in a study about test taking, such as the highest performing and the lowest performing, in order to examine contrast. On the other end of the participant selection spectrum is the convenience sample, by which a researcher selects participants based on availability and ease. For this study, I gathered participants through network sampling, which lies somewhere in the middle of the spectrum and is one of the most common forms of creating a participant sample (Yin, 2014). Network sampling relies on a participant referring the researcher to additional participants. A classmate in my graduate program at The University of Texas informed Jon about my study, and he contacted me about participation. He fit the criteria and agreed to be involved. He, in turn, recommended the study to a fellow teacher, and June soon agreed to be part of the study as well. I gained site approval from the Head of School (Appendix A) once both teachers had agreed and signed the consent form (Appendix B).

Jon and June are both educators at the Austin Discovery School, though in different grade levels and departments. Jon has previous experience teaching history and social studies for many years, and currently teaches math to fourth- and fifth-graders. June is new to teaching, and currently teaches Kindergarten and seventh grade students art and eco-wellness, which includes gardening lessons. As with many teachers, both Jon and June had varying life experiences and understandings (what Shulman (1986) would call intellectual biographies) that brought them to teaching. I sought to understand their experience in the study as holistically as possible, in order to grasp their preconceived notions about art and technology that could impact the study. This led to the decision to

create a narrative method (Webster & Mertova, 2007) of reporting the data I collected about and with them.

DATA COLLECTION AND NARRATIVE REPORTING

Data collection in qualitative case studies is about "asking, watching, and reviewing" (Merriam, 2014, p. 85). Data is the evidence to a case study, and as such is essential to collecting accurately (Yin, 2014). Typically, the sources for collecting data are interviews, documents, and observations (Merriam, 2014; Yin, 2014). Researchers should use multiple methods of collecting data to test for validity, which I describe in a later section. I discuss each of three data collection techniques, followed by an explanation of how I used them in this study. First, though, I explain my reasoning for choosing a narrative method of reporting and how it affected the means by which I analyzed my data.

Narrative is common, especially among teacher researchers (Rolling, 2010), because it emphasizes the educational value of stories of human experience (Webster & Mertova, 2007). It is exactly these teachers' experiences that I want to focus on, in order to learn about technology integration, art museum resources, and mobile devices. Narrative reporting enables me to use their words and actions, the data, to retell not only their stories, but my own, in order to create a trio of narratives, one for each Jon, June, and myself, offering multiple perspectives of our experience. With this type of data reporting comes a host of ethical questions, many of which are addressed in a later section. What is essential to consider here is how narrative changes the way data collection tools must be used. Rather than generating reports or themes for classification, I am searching for stories and values (Chase, 2003). Specifically, considering the framework for data analysis, I sought clues about each teacher's relationship to museum

resources, technology, their content area, and their pedagogy throughout the several methods of data collection.

Interviews are generally "guided conversations" between the researcher and participant(s), with the conversation relying on a list of researcher-generated questions (Yin, 2014, p. 110). Interviews are prefered when seeking information that cannot be observed, such as a teacher's interpretation (Stake, 2010). On one end of the spectrum are structured interviews, where a researcher relies strictly on the list of questions they have generated and does not deviate, resulting in a more closed-ended discussion. In the middle of the interview spectrum are semi-structured interviews, which are more open-ended in that they allow for alterations to questions and question order based on the conversation taking place (Merriam, 2014). Additionally, the researcher is able to extend the conversation to include questions beyond the initial list. Interviews without a set line of questioning are rare in case studies and are usually defined as conversation, rather than an inquiry-driven interaction (Peräkylä, 2004). Other considerations for interviews include how the researcher can minimize their influence on the answers given. Clandinin and Connelly (2000) note that the interviewer impacts how an interviewee will respond, from the types and phrasing of questions to the location an interview may take place. This is one example of where a researcher needs to balance the necessity of following their lines of questioning while simultaneously remaining friendly and nonthreatening (Yin, 2014). Interviews should also be recorded with the participant's permission, in order to be transcribed later (Merriam, 2014; Yin, 2014).

The interviews I conducted with Jon and June primarily follow the qualitative research standard, though with the intention to generate a narrative from each participant. I used semi-structured interviews for this study, so I could follow up on interesting statements or inquire further into ideas I had not previously considered. Each teacher

participated in two semi-structured interviews, one before the lesson and one after. Interviews, when used for narrative research, call for a stronger emphasis on life stories rather than reports of how events occurred (Chase, 2003). Key to eliciting this type of response is asking quality questions in everyday language (Chase, 2003). The questions for this study were approved through the Institutional Review Board (Appendix C), and are written in everyday language (Chase, 2003; Yin, 2014). In order to combat the influence I could have on their responses, I encouraged both teachers to choose where and when their interviews would take place. Jon's two interviews occurred in his home in the evening, while June's took place in her classroom after school. Yin (2014) also encourages researchers to record exact words used by the interviewee, as to remove the potential of bias or influence of the researcher. As such, I audio recorded both interviews on both an iPhone and iPad, in case one method failed, and I transcribed all the audio after the interviews were complete. Ethical issues concerning transcription are addressed in a later section.

Documents are another form of data collection in qualitative research. Documents can account for any written artifact, including forms, memos, letters, formal studies, or agendas (Yin, 2014) about the subject or organization under investigation. Many qualitative researchers will obtain copies, scans, or PDF versions of the documents in order to notate and review, as necessary. Yin (2014) specifically discusses how documents are helpful because they can be viewed repeatedly, though they are subject to the bias of their original authors.

The documents collected during this study were the teacher-generated journals, the lesson plans, and June's assignment sheet. Described as a "powerful way for individuals to give accounts of their experiences" (Clandinin & Connelly, 2000, p. 102), journals are intended to provide the teacher's perspective of the process. Field texts are

inevitably intertwined with interpretation as researchers include and omit what they see necessary (Clandinin & Connelly, 2000), and teacher-generated journals offer the chance for the classroom educators to include the details or events they see as important. Jon and June could choose between writing or recording a journal. Audio-recorded journals would require transcribing, though this was ultimately not necessary. The lesson plans gave me an idea of what to expect in the classroom, but also a reference from which to compare when a teacher strayed from their plan. This informed my understanding of how teachers used their knowledge of pedagogy to adjust to a lesson when it was not going in the way they expected. Finally, June's assignment sheet assisted me to understand what her curricular goals were for the lesson, in the larger context of her curriculum.

The last common data collection technique is observation, which includes "information that can be seen directly by the researcher or heard or felt" (Stake, 2010, p. 90). Observation in many case studies can take place at any time during the researcher's interactions with their subjects, in which researchers can take written notes about the situation at hand (Yin, 2014). One of the most common challenges in keeping a field notebook is the need to write down absolutely everything that is occurring (Clandinin & Connelly, 2000). Many of the writings about this challenge (Clandinin & Connelly, 2000; Merriam, 2014; Stake, 2010; Yin, 2014) offer a different piece of advice for limiting the amount of data gathered so the researcher will not be overwhelmed. Clandinin and Connelly (2000) view field notebooks as a cross between writing down what one observes in the field, as well as an opportunity for journaling and reflection. The field notes I took during this study mirror this suggestion, with brief records of phrases said by each teacher, description of events, as well as comments made by each teacher to me or reflections I had about their pedagogy. I wrote all the field notes and later transcribed them for clarity and data review.

All audio data needed to be transcribed in order to be analyzed. This method of transferring what is said onto paper is not without interpretation (Clandinin & Connelly, 2000; Mishler, 2003). I can attempt to write what was said in an interview, for example, but I inherently will be filtering it through my own lens. Issues of interpretation and values are inevitable, which is one reason for the member check I discuss in the later section about validity.

DATA ANALYSIS: TPACK

A variety of different methods can be used to analyze case study data, all with the same goal of making some sense of the data to help answer the research question at hand (Merriam, 2014). For some studies this means placing data into categories and developing themes; for others it means placing data into computer programs to generate visual maps relating data to one another (Stake, 2010; Yin, 2014). In order to extract the values from my teachers' stories, which are helpful to creating future art museum resources, I analyzed my narrative through the TPACK, or Technological Pedagogical Content Knowledge (Mishra & Koehler, 2006), a framework from teacher research (See Chapter 2).

TPACK helps to identify teacher skills and behaviors within those areas of knowledge, and was used here to help me better understand each teacher's practice. These categories assist a technologist, like myself, to comprehend the complex relationships between knowledge that are negotiated during a teacher's practice. Grossman, Wilson, and Shulman (1989) discuss how within each educator's development of content pedagogy, they have their factual knowledge of the discipline they are teaching, as well as their beliefs about this subject matter. These beliefs translate into the version of history, literature, or science and the method of teaching that discipline an

educator will adopt, meaning they are innately value-laden (Gudmondsdottir, 1995). Gudmondsdottir connects the values an educator defines in their content pedagogy to narrative, stating "Values and narratives are interpretive tools that constitute a practical, but also highly selective, perspective with which we look at the world around us" (p. 29). The data reporting of my study as narrative is thus directly linked to the form of analysis I have chosen, which takes Shulman's (1986) pedagogical content knowledge and brings it into the 21st century.

This framework was useful for my study because it enabled me to look not only at each area of knowledge (technology, pedagogy, and content) individually, but also in pairs, such as technological content knowledge (Mishra & Koehler, 2006). I can look at the data collected in my study and learn how the teachers supplemented one knowledge area from another, and what opportunities exist for the support of teachers' technological, pedagogical, and/or content knowledge. This may be especially helpful for identifying specific teaching behaviors or areas that seem uniquely important. These pre-established themes enabled me to articulate each teacher's growth through an externally defined and theoretically sound framework.

METHODS OF VALIDITY AND RELIABILITY

Traditionally, there are several measures taken to ensure the accuracy of both quantitative and qualitative research. In the case of qualitative research, these items are reliability, which refers to the "dependability of data," and validity, which refers to the "trustworthiness of data" (Webster & Mertova, 2007, p. 89). Due to the subjectivity of narrative reporting, the methods by which these standards are reached differ. Many case studies require triangulation, in which several methods of data must corroborate a finding, though my study did not utilize triangulation (Clandinin & Connelly, 2000). This

study aligned more with Huberman (1995), who argues that more holistic techniques of ensuring validity are needed, such as access, verisimilitude, and familiarity.

This study addressed the techniques as suggested by Huberman (1995) with the stories and data serving as the basis of the narrative accounts and the conclusions drawn from them. I used the narrative portion of the data in order to create a sense of the culture the teacher works in and the knowledge constructed between us, enabling access for the reader (Webster & Mertova, 2007). Verisimilitude is accomplished through the honest reporting of the data and the data reflecting the findings accurately. Familiarity relates to the routine nature of events (Webster & Mertova, 2007). Since the narrative follows two teachers through a lesson in their classrooms, a clear familiarity is established. Additionally, I used a member check, meaning I asked my participants to read my report and verify what I wrote was accurate (Stake 2010). This verification of truthfulness will ensure an honest telling of these two teachers, as determined by the data gathered during the course of this study.

CONCLUSION

This qualitative case study utilized narrative reporting to convey the experiences of how a pair of teachers used mobile technology and art museum resources in their classroom curriculum. Relying on methods from both narrative and case study, I sought to represent the experiences of myself and the teachers with the utmost accuracy. Analyzing data through a trusted framework in teacher research, the TPACK, contributes to this need to be accurate and truthful.

Looking forward, the next chapter consists of several stories about me, the researcher. I am compelled to tell these stories, many of which are about teachers, education, art, and technology. They begin in my high school days and continue through

my adult life, in many ways establishing who I am and where I come from as a technology-minded arts educator.

DATA SECTIONS

The following three chapters contain stories of the experiences of myself, Jon, and June. I begin with my own stories that lead me to this research study.

Chapter 4: Motivations

"Narrative processes tell a story that informs others of who we are, where we come from, where we are going, and what our purpose may be" (Rolling, 2010, p. 6).

I found the following stories of my life are necessary to tell before embarking on the journey of this study. These stories illuminate how and why I became involved with teachers and education, and why I am both inspired and uniquely positioned to conduct this research. My role in this research is complex, as I serve as both a researcher and, in some ways, a participant, so it is ethical and necessary to tell these stories to reveal my biases and values. I tell several of my own stories here, and in the subsequent chapters explore the stories of Jon and June. Here, the stories follow my educational life to this point, including the teachers who have continued to motivate me long after our classes together. I describe my love for movies and how this translated into a love of art. I tell tales of my time with one of the largest technology corporations in the world, where I was reminded of my love for teaching. Finally, I talk about my experiences so far in the art museum, including how it has helped me bring all of these parts of my life together.

TEACHERS

My first set of stories is about teachers. I grew up in California and was fortunate to have great teachers. From the teachers in my personal life; my mother and my sister Tara; to the teachers in my educational life; Mr. Piscioneri, Ms. Jenkins, and Dr. Jenkins, to name a few; they all fostered my love of education early and often. I was an avid

reader, like my mother before me. We frequented the library and used bookstores, and I remember my aunt giving me books for my birthday and Christmas because they were always my favorite presents. Growing up, I was truly fortunate to be given a great education from the public schools I attended. My classroom teachers were very much my role models, and were likely overwhelmed with the attention and enthusiasm I showed them. Mom and Tara taught me to love school and to take advantage of the opportunities school could afford my future. Their encouragement worked, and much of my childhood was spent reading, doing extra credit classwork, and looking forward to school each day. School was easy to me, easier than anything else I had done, and my teachers made me want to go.

Once in high school, I started to see some of my teachers as friends. I joined the Peer Mentoring class, and the faculty advisers here were some of the best teachers with whom I would ever have the chance to work. Mr. Piscioneri and Ms. Jenkins, affectionately referred to as Pish and Jenks, both taught several remedial reading classes in addition to the Peer Mentor group. They were incredibly hard working, taking graduate courses in educational leadership on the weekends in addition to teaching their academic classes, all the while keeping close mentorships with many of their students. We had frozen yogurt together after school events, greeted each other with hugs, and frequently ate lunch together. I spent many afternoons in their classrooms working on Peer Mentor projects and began to see the struggles of being an educator firsthand: miscommunications with administration, a lack of resources, a struggle to develop professionally, and ultimately not being able to address all the needs of all the students. Pish and Jenks would rarely complain or address the issues directly to me, but I was perceptive enough to read between the lines. While the school administration was focused on No Child Left Behind and the new emphasis on test scores, Pish and Jenks

were also balancing how to help students deal with the personal challenges beyond a high school student's grasp, like living in poverty. Being a teacher was more than teaching; it was a balancing act of monumental proportions, with the future of many students at stake. Despite the seemingly never-ending list of reasons why to leave the field, both Pish and Jenks have continued to work in public education, and have cheered me on throughout my academic and professional journey. Because of them, I knew I wanted to be involved in teaching somehow. They set an example for how we as students could persist with positivity despite set backs, to improvise when plans fell through, and to challenge one another to improve. They showered me with support as I prepared to leave for college, a young woman with a clear mind and positive attitude.

Moving out of state for college was not only a big change for me, but also one where the end goal was hardly clear. I received a scholarship to attend the University of Arizona, where I planned to major in Secondary Education. Other than my sister, I was the only other person in my family to have gone to college, and I was the first to leave Southern California to do so. Tara was finishing her Masters' degree as I went to college and would begin her teaching career as an elementary school teacher soon after I left. I remember my grandmother asking me when I would become a teacher, figuring I would follow in my sister's footsteps. It was something I had yet to rule out, but I would need my degree before returning to California for my teaching credential. It was as if my profession had been chosen for me, all I had to do was choose the subject I would teach. Before I could take a single education course, though, I was drawn towards an elective that would later change my academic pursuits and place my teaching plans on hold.

I honestly enrolled in *Discovering Cinema* at the U of A because I had wanted to take a film class in high school, but could never work it into my crowded schedule. I had been warned it would not be as easy as it seemed, and my professor made sure it was one

of the hardest yet most rewarding classes I would ever take. Dr. Jennifer Jenkins, a petite woman with short hair, a comforting smile, and a self-described hummingbird temperament, taught the nearly three hundred freshman in my first film class with ease. She had the charisma and tenacity to hold hundreds of students' attention during screenings and lectures, where other professors fought to keep us off our phones. Her course was challenging yet accessible, a prime example of how to stretch the capabilities of students without putting success out of reach. Lectures were organized to incorporate the artistic, historic, technical, and literary influences that fueled film movements. Many times I would recognize a title of an artwork or event in history that I had learned in high school, yet the context in which I learned it during this class made it solidify and come to life. We watched movies, read book excerpts, and looked at fine art, tracing trends and developments in film genres. I took advantage of Dr. Jenkins' office hours, which we spent in her book-filled office dissecting my writing and talking about additional viewing and reading. She eventually encouraged me to take her upper division course about Mexican film, something that was only available to Film majors and, before long, I decided to double major in Film Theory and English.

The more advanced classes I took, the more time I spent connecting art, literature, and film. In my mind, art was restricted to the paintings locked away in European museums. In high school, the only exposure I had to fine art were slides of Baroque paintings in Advanced Placement European History PowerPoint presentations. Art seemed so disconnected from my life. The more I studied film, though, the more apparent became the connection between art and literature. From script writing to costuming to set design to editing, movies are one of the most commonly accessed and shared forms of art in contemporary American culture. Largely thanks to Dr. Jenkins and fellow professor Dr. Homer Pettey, I was challenged to broaden my perspective of what is art and what is

culture. I found myself drawn towards film, art, and literature, even though I did not know where in these fields I would ultimately land. And while I had yet to decide where that was, I made it my educational goal to learn as much about this newfound love as I could. Some art historians look back on their undergraduate art history classes as the foundation of their careers, while I as an art educator, look to the film and literature classes I took from Dr. Jenkins and Dr. Pettey. I continued to develop valuable aesthetic analysis and writing skills as I earned my degree, unsure of exactly where these abilities would lead me, but confident that if I stayed true to myself, they would be invaluable.

TEACHING IN THE WORLD OF TECHNOLOGY

My second set of stories is about my first experience being a teacher, though not through the path one would expect. I took a job in an Apple Retail store in Tucson during my junior year of college. I came upon the job almost by accident, submitting an application after a particularly difficult day working at a coffee shop. I had three interviews in a week and started work on the day the iPad was released. I must admit I knew little about the iPad or Apple when I started: I had never before used an iPod Touch. I questioned just why the Apple Store managers had hired someone who had little experience with computers, but I anticipate I would learn an enormous amount, very quickly.

As one might expect, Apple has a stellar training strategy, and much of my learning took place on the sales floor, with the devices at my fingertips. While I had a manual of descriptions and details about the products, I truly learned by trial and error, and alongside customers doing the same. It was real life problem-solving, simultaneously enabling me to learn to think technologically while speaking in plain language. I soon realized much of my job was not selling the products, but rather teaching people to

understand what the devices did, how they could be helpful, and how to fix them when something went wrong. I helped people of all ages, from five-year-olds to parents to snowbirds. Tucson is infamous for its snowbird community, an affectionate term for a mostly retired community who live in cold areas for most of the year and have a part-time home in the sunny desert for the winter. Many of them gathered at the Apple Store for weekly or daily training sessions to get personalized help with their Apple products, and sometimes just to chat with us trainers or with each other. There was a range of these adults; some who had been working with technology before they retired, others had sons and daughters who gave them iPads as gifts to keep in touch with one another, and even some who were eager to gain a new hobby.

Teaching a five-year-old is drastically different from teaching a mother or even a grandmother, and I could work with this range of ages several times each hour. Little did I know then how this experience would mirror my future career as a museum educator. I battled internally over how exactly to handle these varied "students," and in the end it seemed easiest to teach everyone with the same patience and understanding as I would my own mother, grandmother, or sister. Sometimes this approach backfired, but mostly, despite their frustrations with the devices, I could tell people really appreciated being treated with kindness. This taught me, among other things, the flexibility, attitude, and awareness necessary to continue to teach effectively as I transitioned from my sales position to an inventory position and finally to the most coveted job of all: a Mac Genius.

Surprisingly, most of the training I did when I became a Genius was not to learn everything about how the devices functioned, but rather how to handle "customer service situations." I would learn the minutia of troubleshooting as I went along, but there were certain people skills, like empathy and clear communication, the company thought were important for Geniuses to practice during training. For me, though, working with

customers was not about customer service as much as it was about teaching. Sometimes computers were actually in need of fixing, and other times there were educational opportunities, an Apple phrase for instances where a customer needed to be taught how to use their device. By seeing customers' visits as opportunities for learning, I could usually resolve the situation by sharing what I knew. My role was more about being a genuine person with a positive attitude, giving a clear explanation of how or why the task failed to work, and providing a solution that involved teaching a customer how to make their device work the way it was intended, or finding another way to accomplish the same task, what is known as a work around. There were plenty of situations much more dire than that, but in reality, that was my day, everyday, and as exhausting as it could be, I absolutely loved teaching people everyday. I did this in Tucson until it was time to move back to California in October of 2010, where I was fortunate enough to transfer to an Apple store near my home. I stepped into a new, yet oddly familiar setting, a whole new group of colleagues, a new group of regulars (students) to meet, and the same opportunities to teach day after day.

While I loved the opportunity to teach and work with such a wide variety of people, seeing a new student every 15 minutes for 8 hours a day soon became more and more draining. I watched film friends move from being interns to writers and producers, and education friends moved from student teaching to their own classrooms. It was clear to me it was time to move on, but this was not to be the end of my teaching days. Being immersed in the technology world influenced how I viewed technology's role in education, given the frequency with which I encountered teachers, parents, and students who relied on their devices to personalize their learning experience. It was not important to me that people used the latest gadget, but rather that I saw the potential in creating memorable learning experiences with technology. Educators could develop learning

opportunities that may be replicated and individualized across many different types of people in various locations. It was unclear to me, however, what impact this belief about technology in education would have on my future career endeavors. No matter where in education I would land, though, more school was going to be necessary. Before pursuing further education, however, I volunteered in my sister's classroom, seeking to decide if classroom teaching was right for me. I quickly realized it was not. If I thought a new student every 15 minutes was hard, the thought of 35 or more students for an hour and a half, four groups a day, then grading assignments, was beyond my comprehension.

MY AH-HA MOMENT

It was summertime when I realized what I wanted to do. Tara and I were at Disneyland, as we frequently were, due to the luxury of living in Southern California and possessing annual passes. It was a particularly hot day, and we were looking for somewhere to cool off while my nephew napped in his stroller. Walking along the streets of California Adventure, we stumbled across a small faux theatre building, one that had housed something different each month it seemed. The exhibition titled *The Art of Frankenweenie* caught my eye. During my last semester in Tucson, Dr. Jenkins taught the senior seminar on American film director Tim Burton. The class members looked forward to his new movie, *Frankenweenie*, which was to be released the following summer. It was easy to convince my sister to join me in the quiet, air conditioned space to investigate the exhibition further. We stepped in, cool air blasting our damp faces. Under tempered glass cases lay various ephemera: drawings, journal excerpts, and character models that provided insight into the creative process behind Burton's film *Frankenweenie*. I quickly recognized the Gothic art and literature influences, and was eager to tell my sister every detail I remembered from class, pointing to examples

excitedly. She listened intently, nodding and smiling, no doubt wondering how and why I knew so much seemingly random information. As we walked through the exhibition, I witnessed people of all ages spending time connecting with the artwork and small scale models; pointing, laughing, and asking each other questions. It was then I realized that this was how and what I wanted to teach. I wanted to teach not in a classroom, but in an informal setting. I really wanted to teach about artwork and literature, and in a way that placed the art in the center of how students understood their world. The seed was planted that day, saved in the form of a note on my iPhone that simply read, "This is what I'm supposed to do."

BECOMING A MUSEUM EDUCATOR

My third set of stories is about my evolution into museums. Many museum educators have long histories with museums, visiting them as children or becoming hooked as a young adult. My experiences with art felt disconnected until college, and I was not what one would call a "museum person" until enrolling in my masters' program. I had looked to Dr. Jenkins for advice about what type of graduate program I could enroll in, knowing I wanted to engage with the public while teaching about art and film in an informal setting. She challenged me to consider what kind of institution I wanted to be a part of, whether my interests were in archival work, museums, communities, or libraries. In my eyes, these are all partners in creating and sustaining creative communities, therefore I sought a program that would not restrict me to learning about only one area of art education. Because of this, I applied to only two schools, with the main goal being The University of Texas at Austin (UT), for a degree in Art Education focused on Museum Education. At UT, museum, school, and community-based art education students are invited to take classes in all of these areas in order to develop the skills and

knowledge useful in each of them. I was accepted, received a transfer to an Austin Apple Store, and started my program a few months later.

Just days into my Masters program at UT, I realized I was not only the go-to person for helping others out with their Apple products, but also that I knew very little about working in museums. I could teach someone a concrete fact about their computer, but guiding a group to create a personal, meaningful experience with a piece of art was a completely different skill set. Also, not all museum educators valued technology as a part of the museum experience, and I quickly realized there was a lot to learn about how the museum experience could be negotiated. And, while I might enjoy using technology in my everyday life, a battle waged on within museum communities about whether technology in the galleries was ultimately necessary. I have spent two years at UT learning as much as I could about how to balance the roles of museum educator and "technologist." Social media has been an important tool, as I have developed an ever-growing list of museum technologists to follow on Twitter, blogs to keep up to date with, and Facebook pages to track. From these professionals and their discussions, I have and continue to absorb as much information as I possibly can, alongside the comprehensive theoretical and practical application courses I have taken at school. The Texas Art Education Association's and the National Art Education Association's annual conferences have been tremendous learning experiences, broadening my perception of what art education can be and what challenges our field currently faces. Admittedly, I have attended nearly every iPad-based program available, while also presenting at each of the annual conferences I attended. And, while these conferences were packed with information, strategies, and networking opportunities, I found my greatest learning experience about museums would happen once I became a part of one.

I left Apple in June 2014 in order to take a full-time summer internship with the Education Department at Artpace in San Antonio. UT's masters program required an internship, and I decided to take a leap of faith and dedicate myself to Artpace for the summer. Artpace is a contemporary arts organization self-described as somewhere between an art gallery and an art museum, with an International Artist-in-Residence program housed in a repurposed car showroom in downtown San Antonio. It has an education staff of precisely two. The Director of Education, Kaela Hoskings, and the Associate Curator of University and Teen Programming, Taylor Browning, both of whom had attended the same program at UT I currently did, and were eager to have someone with my technical expertise on board. They taught me how a small education staff functioned (everyone does a bit of everything) and worked with me to develop my skills while utilizing the knowledge I already had. What I appreciated most was that they gave me the freedom to make my own mistakes and find my own learning opportunities, while still providing critical and immensely helpful feedback and support. The work I performed that summer was hands on: I interviewed the Artists-in-Residence, I collaborated on gallery notes, I edited video and compiled tour outlines, I created and implemented lesson plans, and I gave as many tours as I possibly could. There were significant learning experiences throughout all of these tasks and assignments, full of the practical experience I would need in an education department, but the work we did to prepare teachers for the school year was the most meaningful to me.

Early in the summer, I had the opportunity to participate in a teacher workshop held at another San Antonio art space, the Marion Koogler McNay Art Museum. Kaela, a former classroom art teacher, was facilitating the workshop and she asked me to come with her and take part as one of the teachers the workshop was intended to serve, instead of as a museum educator. It was the first workshop I had ever attended and I was

fortunate to work alongside a spirited group of local teachers. Many in attendance were the only art educator in their entire school, while others were math or science teachers looking for visual arts projects they could bring into their classrooms. Kaela began by leading us in a short discussion about the connection between the artistic process and the scientific method, and then we were led on a tour of the McNay's new exhibit, *Love Reigns*. We made observations and took notes about the artwork, jotting down anything from what we thought the artist's intentions were to how designs were created. Next, we took our notes, made hypotheses, and created artwork inspired by the exhibit, pulling from a wide variety of vibrant materials. It seemed a simple workshop, but there were several significant details I noticed after reflecting on the experience. The interdisciplinary premise, connecting the scientific method and the artistic process, was exactly the type of lesson that could connect science and art. I remembered how as a student history made more sense to me through the lens of film and art, and how valuable that connection may have been earlier in my education. This was also an opportunity for teachers to experiment with unlikely materials such as neon stickers and cellophane, while networking with one another. The teachers around me talked about their intentions of coming back to visit the museum and how they would use these lessons in their classrooms. Collaborations began to take shape between teachers in the same schools. Tucked into each teacher's notebook on their way out of the museum were the lesson plans for the project we had just done along with one of Kaela's business cards.

As I helped Kaela clean the materials table, several teachers stopped to thank her for the lesson. While I have no way of knowing how many teachers later used these resources or contacted Kaela or the McNay educators, the conversations I witnessed led me to believe that many of the teachers valued opportunities like this, where they could

obtain a concrete lesson plan for the classroom, or adopt a new, interdisciplinary way of thinking that they could bring into their curriculum.

I kept in close contact with my sister Tara during my summer in San Antonio, partially because she was worried about me living alone in a new city, but mostly because I kept thinking about how the work I was doing in the museum would translate into the classroom. Museum education staff spent plenty of time creating resources for classroom teachers, but I wondered how applicable it would be to different content areas. I was Tara's go-to person for all things art/museum/technology-related and she was mine for all things teacher-related, so we talked a lot that summer. I told her about the teacher workshop at the McNay, which impressed her as well. As an English teacher, though, she had never attended a museum teacher workshop or received any training on how to teach with visual art. Throughout that summer at Artpace, I pondered how I could connect her with these types of resources.

Meanwhile, Kaela tasked me with incorporating the Texas Essential Knowledge and Skills (TEKS, Texas' state education standards) into the lesson plans Artpace had available on the website. I learned later this push for standards-based lessons was common throughout museum education, as a result of the schools' renewed focus on standardized testing. I remember complaining to Tara about how frustrating standards were to distinguish from one another and how it felt like I was writing in a secret teacher code. She laughed, and reminded me that teachers needed to include them throughout their lesson plans. If a lesson did not address the standards, it was unlikely to be included in the curriculum. If Tara did not have experience teaching visual art as it connected to the standards, there was little chance she could include it in her curriculum even if that was what she wanted. I did my best to send Tara resources I thought would be useful for her middle school curriculum, while I was also thinking about how to reach educators

who did not have connections to an art museum. That summer at Artpace taught me many more lessons in museum education, but one of the most important ones was about myself, that I am a museum educator. And I am one who believes supporting classroom educators is essential to our mutual success.

TECHNOLOGY ART MUSEUM EDUCATOR

So, this is where the storylines of my life meet. Thanks to a group of incredible teachers, I have a spirit of lifelong learning that guides me to take risks and pursue my curiosities. I admire the expertise of classroom teachers, who have an understanding of what is possible and plausible within their curriculum and with their students. In my own experience teaching, I have learned how to adapt to different types and ages of learners, and acknowledge the unique skills necessary to effectively teach such a wide variety of learners. Film guided me to understand art and history, and continues to fuel my understanding of the culture of which I am a part. I also am an optimist about the potential for mobile technology within classrooms and galleries alike, but with the pragmatism necessary to realize this is my ideal, rather than the reality. As an art museum technologist, I also recognize the necessity for our field to continue to adapt to meet the needs of our audiences, from teachers to toddlers. While I am neither a seasoned art teacher nor an established museum art educator, I am a bit of both with a desire to use technology to its potential appropriately with our students and our visitors. I carry the lessons of these stories with me as I look forward to working with Jon and June, hoping to anticipate any technological or museum-related need. Simultaneously, I am aware that each teacher has their own skill set, and I look forward to learning from them as well as we work together to integrate art museum resources into their curriculum with iPads.

Chapter 5: Jon

This chapter chronicles the story of the teaching experiences of the first educator, Jon, who participated in my research. In becoming of subject in my study, Jon agreed to be interviewed twice, to write a journal and a lesson plan, and to let me observe his class while he taught the lesson. Because Jon did not ultimately record a journal, I integrated reflective questions about the lesson into our second interview. This chapter is divided into sections, each describing a different phase of my research with Jon. Between each phase, I include a brief reflection from my perspective, as a researcher and technologist. Within this data I am specifically seeking information about how Jon chose and used online art museum resources as well as mobile technology in his curriculum. Additionally, I sought to find out how he utilized knowledge of pedagogy, technology, and subject content in his teaching. This chapter begins with a brief explanation of how Jon became involved with my research, followed by our first interview. We discussed teaching, technology, and professional development at length. Next, I present his lesson plan, and an account of the lesson plan in action. We met for a final interview to reflect upon the experience. The chapter closes with my reflection on this final interview, as well as a brief consideration of the experience with Jon as a whole. The story of Jon's experiences, I hoped, would yield useful information concerning creating online art museum resources and using mobile technology in elementary classrooms.

Becoming a Participant

Before he was a subject in my study, I knew Jon through his wife Amanda, my classmate in The University of Texas' Art Education masters program. He was a social studies teacher and she was an art teacher in North Carolina before they moved to Texas, though both left the classroom upon arriving in Austin. For the first year of Amanda's

program, Jon opted to teach only online and take care of their two young sons at home. Most of the time when I saw him, Jon was strolling through the Art building hallways with the two boys in tow, dropping off Amanda's lunch. By the second year of the program, though, Jon admitted he missed being in the classroom with students, and he accepted a position to teach in a local elementary school, Austin Discovery School (ADS).

In early 2015, I sat in the Art Education program's teaching assistant's office with Amanda and a few other classmates. I was struggling to find teachers to participate in my thesis study, and the urgency to find them in time to conduct the lesson before the school year ended was pressuring. Even if I found a pair of teachers to participate, how would I manage to get the administrative approval I needed?

"Why don't I ask Jon?" Amanda said, picking up her phone and beginning to text. I must admit I had not even considered asking any teachers I knew personally; I had only been trying to find participants through professional contacts. "Try not to worry," she said, "sometimes charter schools have less administrative requirements to conduct research." I trusted her, and it turned out she was right. Several short minutes later, Jon had not only agreed to participate, but also asked an elementary art specialist at his school to participate, too. At the time, I was not sure whether Jon agreed to participate in my study because Amanda had asked him or because he wanted to help as a teaching professional, but the more I got to know him, the more I realized he was a great fit for this research. Throughout our conversations and while observing Jon teach, he challenged my perceptions of how teachers should develop professionally and teach with technology, passion, and purpose.

JON'S FIRST INTERVIEW, APRIL 26, 2015

Jon and I planned our first interview for late on a Sunday night. The boys had gone to bed hours earlier, but Jon and Amanda had just finished a virtual meeting for a webinar they were teaching later that week. It turned out this was typical for them, keeping active in professional development and teaching communities, while still maintaining the family's routine. Amanda tried to keep the family dog, Anna, distracted while Jon and I talked, but it did not stop Anna from giving me plenty of slobbery kisses first. Jon and I sat down to talk in the family room seated on either end of their blue couch, an iPad and iPhone between us recording our conversation. As we sat down, I handed him a list of my prepared questions (Appendix C). He read though it quickly, and laid it on the coffee table in front of us. Ideally, our conversation would revolve around Jon's teaching experience and philosophy, including his past work with museums, teacher training, and technology. What I did not expect was how much of our conversation would revolve around how ingrained technology is in Jon's teaching, but without being the focus. His answers to my questions were much like his normal conversational tone, with each idea leading into the next. He tried to boil down ten years of teaching experience and expertise into a one-hour interview, which began with me asking for a brief history of his teaching career and his teaching philosophy.

"Inspiring Lifelong Learning"

Jon's teaching history spans many grade levels and subjects. He began teaching in 2005 and has taught at both charter and high needs public elementary, middle, and high schools. Throughout these different grade levels, Jon primarily focused on teaching social studies. "I had been wanting to try elementary for a few years," he said about taking the job at Austin Discovery School, "and I'm working at an elementary charter school, teaching science and math, which is a bit of a stretch for me and its been challenging, but

its been fun too." Simply put, his teaching philosophy is about "inspiring life-long learning" for his students, a mantra Jon practices himself. Teaching is about "helping kids find what they really enjoy or what they connect to," he explains, "so it doesn't matter if it's math or social studies to me, if the kids are figuring out how they're learning and how to think, that's really more the focus." Jon seems confident in his ability to teach any subject. I was eager to know more about how Jon is responding to his new school and subject in the current test-centric educational climate.

Austin Discovery School, Standardized Testing, and Teaching Students to Think Logically

Jon explained that the Austin Discovery School is a unique charter school, which utilizes block scheduling and portfolio assessments, rather than single-grade level classes and letter grades. Teachers to facilitate project- and workshop-based learning between subjects, instead of engaging in single-content area instruction. "In this very open, kind of project-based, workshop-based setting," Jon described, "telling kids to sit in silence for four hours and read a very poorly worded test; it was stressful." Regardless, testing is a part of teaching in America today. So, in contrast to teaching to the test, Jon thinks one of the best ways to prepare for testing is to teach students how to think logically. He described how this is accomplished through a reward day called Code Day Thursday.

For one day each week, the students share ChromeBooks to use code.org, a free website where visitors can learn to code and build computer applications. Jon created a Donor's Choose[3] project to purchase the ChromeBook laptops for his classroom, calling them the "cheapest, sturdiest tech that's out there." His students began coding earlier in

[3] Donor's Choose is a website that allows teachers to raise funds from the public to be used on specific projects in their classroom. In Jon's case, he requested funds for 10 ChromeBook laptops, which were funded by friends, family, and anonymous donors.

the school year, and subsequently showed plenty of progress. Jon described how some students are advanced enough to build games. Rather than focus on practice tests and testing strategies, Jon focuses on using technology to develop valuable thinking skills that can be translated to testing. This practice with coding computer programs is key, as far as Jon is concerned. He went on to explain, "in my opinion, [this] probably helps more on the tests and everything; just understanding that logic and logical steps" used in computer programming languages is beneficial and transferrable.

Jon views Code Day Thursday as a pillar in his curriculum, though as a whole ADS' faculty is not as enthusiastic about using technology in the classroom. He explains that when the school was founded, early administrators were leary towards technology, and the sentiment remains today. "I've really been trying to push the technology because there are only small pockets of it at our school," Jon said, "but they're trying to embrace it a little bit more, which is really cool and encouraging." Jon's enthusiasm as he talked about increasing technology use in his school was evident, but I wondered if he was always a technology advocate.

So, I asked Jon, "In your training, when you were becoming a teacher, or maybe as you've gone along, how has mobile technology played a role?" As it turned out, most of Jon's early experiences with technology were not mobile at all.

Let's Find Out Together

When Jon began using computers, they did not look much like the ones his students use today. "I had a really old school word processor that would print; with an LCD screen," he recalled, mimicking typing as he spoke. "You know, to think that my main use for school emails and school communications would be a computer in my pocket is kind of, you know, that's really out there." We both laughed at this, especially

since Jon is well versed in technology now. Early on, though, Jon explained that bringing technology into his classroom curriculum was not an easy task. He described the process for using a PowerPoint in one of his earliest schools:

> Like I said, the high school I was at was very, very high needs so I used PowerPoint and things like that, but it was real tricky. They still had ZIP drives on our computers, and we had this box that the computer was plugged into that was plugged into a big tube TV. So it was kind of cumbersome to try to integrate any technology.

Fortunately, at schools Jon worked at later, he found more technology resources at his disposal. "I just realized that there was a lot of good technology for education out there," he explained, "and instead of trying to figure it out myself, I could just take the kids into the computer lab, let them play around with it, and kinda piece together what they came up with to guide the next group of students that much better." This "let's find out together" model was familiar to me. We used it as a mantra at Apple when staff did not know the answer to a customer's question. At Apple, there were always more resources to check, another senior technician to ask, but that was hardly Jon's case in the classroom during those first few years. Jon continued to learn more about the advantages and disadvantages of teaching with technology, including developing valuable advice for those wanting to redirect distracted students.

"Give Them a Challenge"

Some argue that students are likely to be distracted by technology. And, to some extent, Jon agrees with this, especially when using the Google Maps feature. "I knew every time I have anybody use Maps, they're going to go find their house," he said with a chuckle, admitting to doing the same thing himself. "So understanding that is one thing, but I think that's kind of an exposure thing. If you direct students where to go, one, and give them something engaging to do once they're there… then they're not gonna stray."

And once the students are engaged, a teacher should expect to join in to help them through the challenge. Jon went on, "And two, you also got to be willing and get in there and help and point things out." Part of this, though, is knowing when to help and when to let the students problem solve on their own. Jon explained how, during Code Day Thursday, he is more likely to answer questions from students who are confused about content or curriculum faster than those who have process questions about the program. With students who have process questions, Jon described, "I'll maybe go with them a bit later and kind of hope they figured it out and take a little bit of initiative." It is more important for students to develop troubleshooting skills than to have the answer immediately, though teachers should be prepared to troubleshoot alongside the students. Jon said that for the most part, this approach has worked and he generally does not find students straying off task. "And it's not that way on the playground at all," he pointed out, laughing again, "its not like they're just obedient children." Jon recognized technology's ubiquity and the need for teachers to engage students in interesting content. He stated, "if you just put it in their hands, because it's going to be there, and show them how to use it for different stuff" than Facebook and games, students are more likely to remain on task. This focus on keeping students genuinely interested indicated Jon's priority on relevant content, while concurrently teaching students the importance of technical fluency.

iPads and Teaching Online

Jon quickly realized the potential of mobile technology in education. In 2010, Apple released the iPad. The librarian at Jon's school had purchased six iPads for the school, and let Jon take one home for the summer. In the subsequent school year not only did he become acquainted with iPads, but also he began teaching online. Jon had always

wanted to teach Advanced Placement (AP) level history classes. At the time, he had already been teaching middle and high school history for five years, but Jon knew the AP positions generally required many years of teaching "SAT prep and freshman" level courses. Luckily, he found an opportunity to teach AP history in an online school. I wondered how Jon adjusted to such a technology-heavy teaching practice, so I asked Jon to share with me what helped him become more familiar and comfortable with technology. Jon revealed he participated in many different types of professional development throughout his career to help him develop the necessary skills, though I was curious how he came by them. "So you've done many kinds of different training sessions. How did you find out about them?" I asked.

Preparing to Teach with Technology

Jon described that when he was teaching in North Carolina, a technology consultant from the district was helpful in building the technology skills and practices in his toolbox. Jon described how the consultant would sometimes offer workshops, but at other times "She would come by and just say, 'Alright, these are are all the cool things I found this month, you can try playing with this." The consultant showed Jon different programs, tricks, and tools that might get the students excited. Other helpful professional development came in the form of training opportunities offered by North Carolina's Social Studies Teacher Association. Jon took advantage of as many of these opportunities as he could, saying he would attend "basically, anytime I saw an opportunity where I could go get professional development." Some were in person, while others were held online. "Teaching is not really a profession where you get a lot of perks," Jon half-joked, "so anytime you see that for free or for the cost of a sub for the day you could go and talk

to adults and eat lunch in quiet, if I felt like it could apply at all, then I went. I guess I lucked out because most of them have been really good."

Jon went on to describe an especially impactful training session from Intel, a technology hardware and software manufacturing company, that centered around "how to use technology in the classroom to guide projects and project-based learning." While many years have passed since this training workshop in North Carolina, Jon continues to use many of those project-based skills in his classes at ADS. The training workshop also created the opportunity for Jon to become involved with Intel's online community for teachers, Intel Engage. He is still a moderator for the site today. Jon said he enjoys it because he is able to meet teachers from around the world and share ideas about teaching. Jon seemed to take advantage of a variety of professional development opportunities that came his way, whether the sessions were about technology tools, teaching social studies, or project-based learning. I was curious to know how, specifically, Jon used these training workshops in practice in the classroom. We shifted our attention when I asked Jon what he used his iPad for in the classroom.

iPad in the Classroom

Jon and I talked so much about technology that I started to assume Jon used it for everything, despite the fact we were sitting in the midst of a very low-tech living room. The television and computer printer were the only obvious pieces of technology present, while the room's main focus was a wall-sized bookshelf stuffed with toy bins, art supplies, books, and costume props. A kitchen playset and child-sized table sat along the wall next to the couch. Technology had not taken over Jon's home, nor his classroom, as it turned out. Jon explained he used his iPad primarily for playing music and taking attendance. The portability of the iPad and its Bluetooth capacity to turn music on and off

meant he could have the music as an attention-getter no matter where in the classroom he was. Students knew when the music was on, it was okay to talk to one another, but if the music was off, it was because Jon had instructions to give. Jon went on to explain there is not an abundance of technology on campus, so he brings his personal devices, instead of the school's laptops designated for teachers. Jon's laptop frequently projected instructional content to students and enabled him to access Engage during preparation periods. I asked whether he used his iPad for school-related tasks while at home, and he responded that he did so for my thesis. "I did it to research different museum-based apps and things like that," Jon said, but working from home on his iPad was uncommon. At Jon's mention of museum-based mobile applications, I changed our focus to the lesson he would be teaching. Although he emailed me a copy of the lesson previously, I wanted to hear how he described it aloud.

The Lesson

Jon's and my conversation shifted from talking about his use of the iPad at home to me asking about the lesson I would observe later that week (Appendix F). Jon said the lesson would be the introduction of a project where students would defend whether they thought math was discovered, invented, or both, using examples in art, games, storytelling, and nature to support their opinion. They would watch a clip from PBS' NOVA and work with an iPad application. The ultimate goal of the overall project would be to have students develop a museum exhibit as their final project. Students would be required to write a thesis, then create a museum exhibit defending their stance. During this class period, though, student's focus would be primarily about brainstorming examples of math in their world. While I considered how students would do this, Jon and my conversation switched to thinking about our own museum experiences. While Jon had

already told me about training workshops at museums, I had yet to hear about his experiences with Austin area art museums.

Art Museums in Austin

I was curious to know about Jon's experiences and relationships with Austin art museums, given he is both a parent and a teacher. As a teacher, I wanted to know whether Jon had received any communication about teacher training sessions or specific teacher resources. As a parent, I also wondered whether there were activities in which he and his family took part. Largely, it turned out, Jon had only visited museums with his wife and children. Jon described one of the visits to a local art museum, The Contemporary Austin, which has two sites in town. Jon and his family visited the Laguna Gloria location to attend a family day which he found especially remarkable. "Those are just awesome," Jon recalled. "Really, really incredible, especially the hands-on activities and getting to work with the professionals." His children still used the products they created there, an indication they enjoyed the visit as well. Jon mentioned his school had tried to visit the local Bob Bullock Texas State History Museum in the latter half of the school year. The author of a children's book about La Salle, a 1600s French explorer who travelled through the Eastern and Midwest United States, came to visit ADS. It turned out that La Salle's main ship, *La Belle,* which had been found in Texas' Matagorda Bay in the mid 1990s, was on display at the Bullock. Jon and the other teachers sought to visit the Bullock to connect the author's visit to the artifact on display. "We tried to set up the field trip for the Bullock," Jon described, "but so has every other elementary classroom in Texas for after the STAAR[4], so we were way late on that." While Jon sought to make

[4] STAAR stands for State of Texas Assessments of Academic Readiness. These annual assessments are given to students to measure students' understanding of the Texas Essential Knowledge and Skills (TEKS) curriculum.

concrete connections between museum exhibitions and classroom content, thus far, he had been unable to make educational connections for his classroom and Austin area museums.

There was a special event at the Harry Ransom Center (HRC), a humanities research library and museum on The University of Texas at Austin campus, to which Jon regretted not alerting his students. A graduate theatre class hosted a guided tour called "Reimagining Alice," a program for all ages exploring the HRC's *Alice's Adventures in Wonderland* exhibit. Jon described how the tour guides were dressed as and performed in character as those from Lewis Carroll's *Through the Looking Glass*, guiding both adults and children through the exhibit. Both of Jon's sons attended, and he remembers the actors being very approachable. "[The actors] came and talked to the adults and the kids, but asking them the same questions, which I think is really important," Jon explained. "I think kids pick up a whole lot if you're talking down to them or not." In Jon's experience, kids are perceptive to how they are being spoken to, as an equal or an inferior, and speaking to them with respect encourages them to respond equally positively. It was important to Jon to treat young people with respect and to hear what they had to say. While he was glad his sons could experience the tour, Jon said he "regretted not plugging" the event to his students.

As we wrapped up my list of questions, I asked Jon if there was anything else I needed to know about the lesson he was getting ready to teach. Although he had already emailed me a copy of the lesson, Jon clarified that it would be an introduction to a project. And with that, our interview was complete. Just a few hours later we would meet again, but in Jon's classroom for the lesson.

MY REFLECTION

Leaving our first interview, I had a good picture of Jon's teaching history and philosophy, and knew that he was comfortable using technology in the classroom. He had gone through many struggles I remember facing with early classroom technology, even if Jon experienced them as a teacher and I as a student. During the time he was beginning to integrate more technology in his classroom, I was learning to teach people how to use that same technology in their daily lives. It was interesting to see this parallel between our experiences, despite being in drastically different roles at the time. Jon seemed to have confidence in using technology in his classroom, so when I started looking forward to the lesson I would observe, I expected to see few technological problems. Jon had chosen to use the *Physics in the Art Museum* mobile application, which was new to me. He mentioned he would use his own iPad rather than asking me to bring those from my department, so I wondered how a single iPad would function with a group of students. I knew Code Day Thursday was a time the students commonly used ChromeBooks. Would they react differently to the iPad? I was also curious to know how Jon's new content area would impact his use of the mobile technology. There were plenty of art and history mobile applications from these types of museums, but what types of art museum applications could he use in his math class? He was confident in his Technological Pedagogical Knowledge, but the content on the iPad was of his selection, not his creation. I studied his lesson plan to learn more about what I could expect.

JON'S LESSON PLAN

I received Jon's lesson plan through email (Appendix D). The lesson plan is a one page document with three main headings: opening conversation, table assignments, and

"share out,"[5] covering the hour and a half class session. This lesson was the introduction for a project called Math in the Museum. Jon would begin by engaging students in a discussion about what museums are, and identifying the museums the students had already been to and what they enjoyed about the museums. After a brief discussion, Jon would introduce the guiding question: Is math discovered or invented? To supplement this question, students would watch a 10-minute clip from NOVA called *The Great Math Mystery*. It would be followed by "a brief share out of ideas the clip gave them about math and where it can be found or layered into our understanding of the world." The bulk of the class period would be spent with the students in one of four groups brainstorming mathematical links to the "visual/performing arts," "nature," "board/virtual/athletic games," and "narrative/storytelling." A fifth group would be comprised of a pair of students from each of the other groups, who would sit at a separate table and work with the *Physics in the Art Museum* iPad application. Once the students completed a lesson on the application, they were to go to a new table and send another student to work with the application. During this time, Jon would be circulating to "ask probing questions, take unfocused students and switch their groups" until he found a place where the student could be successful. Jon's goal throughout this period would be to help his students think about "how a museum exhibit could prove whether math was invented, discovered, or both." The last ten minutes of class would be used to "share out." The first question pertained to the application and how it integrated math, physics, and art, while the second two were focused on math in life and what ideas for museum exhibits the students had come up with so far. Overall, the students would spend the class period generating ideas and examples of math in their everyday lives, and determine

[5] To share out in Jon's class means for students to share their responses by answering several guiding questions aloud as a class.

whether they thought math was invented, discovered, or both, and how they could use a museum exhibit to explain their opinion.

MY REFLECTION

After reading through Jon's lesson plan, I recognized two uses of mobile technology: his laptop to generate the NOVA clip, and his iPad to share the *Physics in the Art Museum* application. Usually when Jon's classes used technology, they shared ChromeBooks in pairs. The iPad would be shared between four students, and I wondered whether this would have a negative or positive effect on their behavior. One intersection in the TPACK framework (Mishra & Koehler, 2006) that I was interested in was technological pedagogical knowledge (TPK), and Jon's lesson seemed like it would be a real test of his TPK. The fact that students would switch themselves in and out of the iPad group was also curious to me, and it would be interesting to see how closely students would monitor themselves. In my experience, concerns about students becoming distracted by the iPad were common amongst teachers, though Jon did not seem to be worried. He had mentioned ADS' project-based approach, and it seemed that this lesson would be a clear example of how to facilitate that approach. I found it notable that Jon indicated how he would redirect struggling students by moving them to new table groups rather than asking them to work through the problem. I was curious to see how acknowledging a student's struggle with a specific topic by giving them a new one would affect their behavior and participation. Would students try to be sent to use the iPad instead of brainstorming with the other students? I also noticed that while Jon's lesson plan focused on the practical matters of how the class would move, it did not explicitly describe how another goal of the lesson would be to enhance student's thesis developing skills. The written lesson plan reminded me there would be skills and outcomes that were

not explicitly described, but because I spoke with Jon beforehand, I knew there were overarching goals in Jon's lesson planning. There would be much to observe in Jon's classroom that Monday, and fortunately for me, I would be able to see it soon after our conversation was complete.

OBSERVATION, APRIL 27, 2015

"You have arrived at Austin Discovery School," my phone's voice said as I put my car into park. It was early Monday morning, and I was parked in a nearly empty parking lot. Austin Discovery School was located among several other charter schools and academic buildings off of a main road in east Austin. Never before had I seen an arrangement of schools such as this, with different charter schools such as two KIPP Austin campuses and ADS, in such close proximity to one another. I pondered whether this proximity was commonplace between charter schools as I walked through muddy sidewalks. Austin had recently received several inches of rain, and the roughly paved roads were streaked with gravel from runoff.

Rather than an established sign post announcing the school, I came upon a small sandwich board with the letters "ADS" spelled across the top. Jon had explained how ADS generally relied on project- and workshop-based methods, but upon my arrival, the school had a very different feel to it. The pathway leading to the office was covered, the posts of which were decorated in hand-knitted blankets of sorts. Visible from the side walk were two quaint buildings on either side of a large jungle gym, shaded by a sprawling oak tree. Even with the buildings' advanced age showing, the school had charm to it. A student garden was tucked away in the back. Several jackets hung from the gate surrounding the playground, as if waiting for their owners to return.

Luckily the office was easy to find from the sidewalk. The office had a communal area, where I saw a student reading on a couch. I introduced myself to the secretary, and as I signed in, I explained I was looking for Jon McSween's classroom. She asked if I knew where to go. I sheepishly answered that I did not. The secretary asked the student from the couch if he knew the way. He nodded affirmatively, and I thanked him. The secretary clarified that I would need an aide to accompany us, since I did not have the proper clearance to be with students alone. "Of course!" I replied. An aide from behind the secretary's desk emerged to accompany us to Jon's classroom. We walked quickly down a long hallway, its walls adorned with student artwork and the floor well worn from the tracked-in dirt. Along the walls hung student backpacks, rather than on the backs of chairs as I was accustomed to seeing them. We exited out the back door where a third building stood, separated by a wide field and a sidewalk caked in muddy footsteps. Seeing it as the fastest way to the back building, the student lead us across the muddy field. I could feel the soppy mess inside my open-toed flats.

"Maybe we could walk on the sidewalk?" I asked, hopping out of the mud towards the concrete. The boy and aide laughed and I followed suit, embarrassed. Looking down, I was the only one not wearing rain boots. The three of us continued walking until we reached the third building. When I arrived, the generally calm and collected Jon looked concerned, sighing as I stepped into the open doorway. I quietly thanked the boy and the aide, turning my attention toward Jon and his class. A large group of students sat crosslegged on the classroom carpet. Jon glanced over to acknowledge me while announcing to the group of students that they should get their written journals and we would move over to the next classroom, which turned out to be his room.

"The other teacher I team teach with isn't here today," he explained quietly as the students moved rooms and collected journals. "And his sub didn't show up. So, I have all of the students." Another detail about ADS is that many teachers team teach multiple grade levels and subjects. Generally, Jon would teach the fourth-grade group math while his co-teacher taught the third-grade group science, but not today.

As the students settled into different nooks and crannies in Jon's room, I began to understand why he seemed so tense. Twice the number of students, nearing thirty in total, were crammed into a room meant for under twenty. Jon asked some students to borrow chairs from the neighboring classrooms, while Jon's desk became a table for six students. I sat on a worn couch near the door, from where I had a wide perspective of the very full classroom. The off-white linoleum flooring showed traces of dirt and mud tracked into the classroom. To my left was the white board and projector screen. Jon's sticker-covered Asus computer lay open at the end of a far corner table. Clustered throughout the center of the room, four groups of desks filled most of the classroom's space. Directly opposite from me sat another multi-purpose table, filled with various classroom staples like Kleenex, file folders, and Jon's Bluetooth speaker. To my right was a bookshelf full of student journals, binders, and lunch boxes. What was likely a fluid, workshop-ready space for sixteen students was now crammed with thirty.

The students were energetic first thing on this Monday morning, and Jon had to match their energy to keep them corralled. He began introducing the topic of museums before he had all of the students' attention. The students seemed rambunctious since they rarely all attended math together. He asked the students to think about their experiences in museums, from what they liked about the "visit" to what they did not, and to record these experiences in their journals. Jon went on to explain their reflection can be about any museum, and they would "share out," in a few minutes. Jon repeated the prompt as

he moved from table to table, stopping to get students settled. His students were a mix of third and fourth graders, and they did not seem used to working alongside one another in such close quarters.

Once Jon was satisfied with the number of students on task, he switched his attention to preparing the laptop for the next part of the lesson. He moved the laptop from the front table to a cart near the front of the room, where the projector was already set up. He typed on the computer, presumably loading the webpage in the browser. The speakers were already plugged in and set to send sound to either side of the classroom. Jon left the cable from the computer to the projector disconnected, first looking around to check on his students before attracting their attention towards the front of the room. Noticing that many children were starting to chatter again, he called out to see if anyone wanted to share what they had written. Students reflected about varying museum experiences, from aquariums to history museums, then to children's museums, specifically the one I worked for in Austin.

Jon took this opportunity to introduce me, explaining I was there to join them for class today[6]. I waved from the couch, with several students doing the same from their desks. Jon directed their attention back to himself. "Can anyone tell me something they've learned about at a museum?" Jon asked. A few hands raised; Jon called on one.

"I accidentally learned something at an aquarium once?" the student replied. Some students laughed, Jon smiled and continued to field answers. After a few more responses, he shifted to explaining why he was talking about museums. Museums are places where we can visit to enjoy and learn at the same time. Today, the students would be starting a project where they would need to answer the question: is math discovered,

[6] Jon introduces me and tells his students that I work at a local children's museum, Thinkery Austin. While we did not know it at the time, June had previously worked at the Thinkery as well.

invented, or both? Students would need to think about parts of their lives where they see math and decide whether the math was discovered or invented. To defend their position, the students would create a museum exhibit that explained where they saw math in their lives and that also supported why the math was discovered or invented. But first, they needed to consider where they see math in their world.

To get the students thinking, Jon introduced the beginning of the PBS NOVA documentary *The Great Math Mystery*. He connected the cable from the projector into the computer, and an image appeared on screen. Jon waited a moment, expecting the video to start shortly. "Can you make it full screen?" a student asked from the back. "Do you know how? I can show you." Jon smiled as the video began to play, then clicked full screen to remove the status bar and border from the screen. The students quickly turned their attention to the projector screen as Jon slipped to the far side of the room.

Jon played the first ten minutes of *The Great Math Mystery,* which began by tracing humanity's curiosity with patterns found in nature, which are then further explored through mathematics. Students learned about the Fibonacci sequence, a pattern of numbers occurring in both nature and mathematics. A connection between the Fibonacci sequence and the number of petals on a flower or spirals on a pine cone earned the most attention from students, as oohs and ahhs could be heard throughout the group.

While the students watched the clip, Jon used the far right side of the white board to assign each table group to a subject area: "nature," "visual/performing arts," "narrative/story telling," and "board/virtual/athletic games." Once the documentary's introduction was over, Jon stepped over to turn off the projector and started to explain how the class would begin brainstorming. Each table would be assigned a subject, and the students at that table would think of as many examples of where math could be found in each subject as possible and write them in their journals. Jon would rotate the students to

new tables with different students every few minutes. The table at the front, however, would have Jon's iPad to explore examples of how math was connected to art and physics. He assured students he would try to switch out this group so that a number of students would have the chance to use his iPad. This group was where my attention would be focused.

"Can we use the ChromeBooks?" asked one student. Jon shook his head in the negative. For now, students would brainstorm in groups, and online research would come later. Jon used his iPhone to turn on melodic acoustic music, which could be heard throughout the classroom via the Bluetooth speaker. The students took this as a sign they could begin talking among themselves. I remembered Jon mentioning in our interview he used music as a behavior indicator for students, and I made a mental note to see if turning it off was an effective tool for attracting students' attention later in the class period.

I was watching the iPad group in the front of the room in particular. While the students at other tables were beginning their activity, this group had not yet started to use the iPad. They called Jon over, so I leaned forward to hear more. A student handed Jon the iPad, and he tapped the screen a few times and handed it back. They must have been locked out. As Jon shifted his attention back to managing the different groups, the iPad group huddled together around the tablet, each student sitting atop their feet with their elbows bent on the table. All of them seemed interested in what was happening on the screen, with many small hands pointing to different parts of the screen. The written journals lay forgotten on the table. The iPad group again motioned for Jon's attention. The device could not connect to the school's wireless network. They asked instead if they could go into the hall. He nodded affirmatively and the group moved to the hallway, with one of the girls holding the iPad. I waited a moment, then followed them out to see how their interaction with the iPad was going. The students were sitting along either side of

the hallway, two boys separated from the three girls with the iPad. The two boys were distractedly talking with one another while the three girls waited for the application to load. The girl sitting in the middle held the iPad they were looking at out in her lap, so the girls on either side could view the screen. I stepped over to see.

As the tablet came into view, a cartoon scientist in a white lab coat appeared on screen and began talking. The low volume caused the three girls to move closer together to hear. One girl prompted the other to turn the volume up, and the scientist's voice grew louder, which attracted the two boys to return. It was difficult for all five students to arrange themselves around the iPad, so the two boys decided to view the screen upside down. As they settled in, the scientist cartoon moved to reveal eight lesson options, the selection of which the five students debated. The lessons were listed in two columns, one column including four lessons according to physics topic, with the second column listing lessons by art object. The students agreed on the lesson about torque and Alexander Calder's *Ghost* (1964) mobile. An image of the mobile appeared on the screen. The group of students leaned in over the iPad, which still lay in the middle of the group upon a girl's lap. Just then, I remembered the secretary's warning that I did not have clearance to be alone with the students. I became worried, and erring on the side of caution, I headed back into the classroom.

The room was bustling, with Jon moving students from table to table. There were several students who were not working well together, so he faced the challenge of keeping them apart while still rotating the students through each of the tables. I could only hear the students at the table closest to the couch, but they were talking about music, rhythm, and dancing. They looked to Jon and asked, "Does that work for the project?" He nodded that it did and encouraged them to write down their ideas in their journals. Students continued to move about the room as I checked my watch. The group outside

had not switched with anyone yet, and had been working with the iPad for about 10 minutes. Just then, Jon looked up to the iPad group's empty table, realizing it was about time they switched. Jon was helping the storytelling group brainstorm, but needed to switch out the iPad group. He asked the storytelling students to work together to find an answer, as he headed for the hallway. Subsequently, the iPad group walked back into the room to their table in the front and began writing in their journals. Jon carried the iPad into the room. He tapped several disinterested-looking students to form the next iPad group, handing the device to a student as the new group walked out into the hallway. As they transitioned, Jon paused the music. Most students stopped talking, though a few continued. Jon announced to the students that in five minutes, they would all join back together to "share out" brainstorming ideas. He acknowledged that not everyone had a chance to use the iPad yet, but if there was another center they had not yet visited, they should switch there now. Several students raised their hands to be switched to a new group and Jon directed them where to go.

I stepped back outside to see how the new group in the hall was doing, aware that I should not be alone with them for long. They had moved into a third empty classroom across the hall. There were five students, but only two of them were working on the iPad. The other three were taking advantage of being in an empty classroom to play. The two with the iPad had *Physics in the Art Museum* open, this time learning about how swords are designed and constructed. They seemed interested to learn about and see many examples of swords, but sent annoyed glances at their distracted classmates. I lingered for a moment, listening to the lesson's audio as it guided students through how a sword's design determined its usefulness. If a sword were to be useful for a nobleman, the application explained, it needed to be balanced. The students began watching a video

about balance and the center of mass as I walked across the hall, back into Jon's classroom.

"Wrap up your last thought," Jon announced, tapping on a student's shoulder. "Can you ask the group out in the hall to come back in?" he asked quietly, motioning to the door. The student agreed and walked out the door, returning quickly with a trail of students. The students moved clumsily into empty chairs, one setting the iPad on the table while another passed journals back to their owners. Jon began by apologizing that not everyone was able to use the iPad, but promised they would be able to work with it in the future. Once almost everyone settled in, Jon began to pose the final guiding questions. For those students who did use the iPad, what did they see or learn? Several students raised their hands and Jon called on one to describe what she learned from the *Physics in the Art Museum* application. The young girl from the first group reported she learned about color. "What about color did you learn?" Jon asked. She explained there is a spectrum of colors, and the colors we see depend on the wave length. The young student described how the application showed sunflower paintings, and that she saw mostly yellow because yellow light was being reflected from the painting. Jon thanked her and asked for one more volunteer. A student from the second group recalled how there are different parts of a sword, and regardless of what it is used for, it needed to be balanced. Jon thanked him, reiterating how the application featured both artwork and physics vocabulary, which was similar to what the students would be doing with math. He moved onto asking about ideas generated from the table discussions. "Where did math appear in nature, games, art, and the other tables?" Jon asked.

A student mentioned the rhythm of music and how musicians keep time. Another referred to botany, repeating an example from the video at the beginning of class. Gradually, students became restless. Jon called on one last student, who gave an example

from chess. Jon nodded, affirming that chess was a good example. Jon asked his students to keep thinking since they would need to pick one of the examples they had written about. The students would use this example to defend whether they thought math was discovered, invented, or both. Jon excused them to put their journals away and get ready for recess.

The students scattered between Jon's room and his co-teacher's room, putting away journals and grabbing snacks. I was left on the couch scribbling notes into my field notebook. I stood up and thanked Jon, who assured me I was welcome in his classroom. We made plans to meet again soon for the final interview and I headed back to the school's office to sign out.

MY REFLECTION

After observing Jon's lesson, I wrote a few notes to myself. First, I noted that Jon was using nearly all of his own technology, from the iPad he put in the hands of the students to the computer from which he played the clip, rather than using the school-issued equipment. He incorporated the museum application and technology without making them the focus. His lesson would have functioned well with just the video and the discussions, but using the iPad to access concrete artistic examples gave students a clear idea of what Jon wanted for their project. It seemed from Jon's lesson plan that ideally the iPad group would function like the other table groups, though I noticed much less journaling at this table. Those working with one another at the other table groups, though, did not seem distracted by the iPad or disappointed that they were unable to use it during the class period, like I might have expected.

Jon used his pedagogical skills to manage the large group well, but I wondered what he would have done differently, if he only had half of the students as he had

expected. I noticed his lesson plan rarely mentioned journaling in particular. Had that come about since there were so many students? The fluid learning environment was beneficial for this situation, with students encouraged to move to other areas to better interact. It was beneficial that the iPad was portable, since connectivity problems with a stationary computer would have likely meant removing the technology from the lesson altogether. Jon's practice of using the Bluetooth music as an indicator for talking in class seemed effective to get his student's attention. Jon and his students' familiarity with his technological pedagogical practices benefitted him during the hectic lesson. Jon wanted students to move desks and collaborate, even allowing students to shift to the hallway, if needed. He was the orchestrator of their learning, but during this lesson especially, much of their learning came from working with one another. Jon set the stage with an engaging clip, but it was clear these students had worked in teams before. The learning environment of the school seemed to lend itself to technology use despite the school administrator's concerns about technology in the classroom, but I thought Jon's trust in his students was equally significant. Still, I looked forward to hearing Jon tell me about how he felt his lesson had gone.

JON'S FINAL INTERVIEW

Some Things Stay the Same

Jon and I met for our second interview in the same spot as the first. It was a Sunday night, his kids were already in bed (though of course they snuck out to say hello), and Amanda was moving about, trying to keep Anna, the dog, at bay. The living room had been reorganized in preparation for incoming house guests, the large bookshelf organized with even more books and toys. Jon and I sat on the same couch in nearly the same spots as our last interview. We chatted about their pending move for a few minutes,

then Jon looked at my prepared questions (Appendix E) as I set up the iPad and iPhone to record. I was curious to hear Jon's reflections about the lesson, since all had not gone according to plan, but we started by talking about the same topics we started with the last time. I wanted to see if anything had changed.

"So, throughout this project with the kids," I began, "has your or did your teaching philosophy change at all?" Jon mentioned it was helpful that the mobile application gave a ready-made example for what he wanted the students' projects to look like, but, no, his teaching philosophy had not changed. After all, this kind of lesson was not terribly different than his normal teaching. From this, I knew I could almost answer my next question for him. "Has your comfort level with technology or using technology with your kids changed?," I asked. Jon shook his head in the negative, replying, "Again, not really, it's just always good to see a different way of using it, but I guess for the last five years I've been trying to use technology in as many ways as possible, so it was cool to bring in an iPad because I haven't used one yet at the school."

I had not realized this was the first time Jon had allowed the students to work with his iPad. I asked him how he thought his students responded to using the iPad since it was their first time. He said they reacted well. "Luckily, I've had them working with technology and so they kind of know my expectations," he said, describing his students as "tech natives" who used touch screen devices regularly. "So, it wasn't like a new toy and, being that it was an older generation iPad, it wasn't even that fancy really," Jon said.

While Jon's students reacted to the iPad well, he was not able to use it quite as he had planned. "It was kind of unfortunate that the sub didn't show up and I had all the students, so I couldn't give all of the attention to the small groups using the iPad as I had wanted," Jon recounted. While I wanted to know more about what Jon had envisioned for

the lesson, I first needed to know how the lesson was developed. I asked him to walk me through the planning process.

Planning the Lesson

"Well, I had originally planned the lesson for just answering the basic question: is math real or invented?" Jon began. He went on to explain that answering this question provided the opportunity for students to form a thesis and argument that would require support, even though there was no correct answer. "But do that in a math class because, you know, I'm not really a math teacher and kids don't know how to write good theses. So I thought maybe if we put those two things together, it could work or be a big flop." Jon laughed as he said this, and went on, "but, then when you mentioned using a museum app, I thought maybe that would be a perfect project outcome, and then I started researching art museum apps." He recalled a webinar he had taken with the Crystal Bridges Museum of American Art, and started by looking through mobile applications suggested during the webinar. He found:

> *Physics at the Art Museum,* which was just perfect and went right along with the NOVA clip that I was going to use to kind of pose the question, Is math discovered or invented? Because it took students through either different collections for different physics ideas, depending on which little mini lesson they chose on the iPad.

The *Physics at the Art Museum* (*Physics*) (Drexel University, 2015) application aligned with Jon's plan for what he wanted his students to develop, since, "it showed them kind of what a final product could look like and how they could explain the math in it."

The Museum Resource

I was interested to know more about the *Physics* iPad application for a few reasons. While Jon had already developed and taught his lesson at the time of this interview, I had just completed research for the other teacher participant, June. She did

not have much experience with mobile technology, so I was compiling a list of potential classroom resources for her. Throughout my research for June, the art teacher, though, I had not seen *Physics*. Second, Jon was doing his research for mobile applications independently, and I was curious to know why he picked this one. He explained it was developed by Drexel University and the Philadelphia Museum of Art. Upon further investigation, it turned out the application was a collaborative project between members of the Drexel University School of Education and Learning Technologies Group together with the Philadelphia Museum of Art's Wachovia Education Resource Center (McKechnie, 2014). The application explored physics concepts as they relate to specific art pieces. One example in the application is *Diana* (Augustus Saint-Gaudens, 1894), a sculpture of a woman balancing on the ball of her foot while shooting a bow and arrow. Students could view an image of the artwork, learn briefly about its history, then consider whether Diana would maintain her balance or fall if she were to let go of her arrow. The application uses this hypothetical situation to tie the sculpture to momentum, or mass times velocity, and Newton's 3rd Law, which states that for every action, there is an equal and opposite reaction. With this application, Jon was able to provide his students an example of what their project could look like, but also be exposed to these interrelated concepts.

"The one that stands out the most that I remember as a giant mobile in the museum," Jon said, describing *Ghost* (Alexander Calder, 1964). "It [the application] talks about balance and torque and the forces of spinning versus the forces of gravity and how much physics the artist had to put into making that artwork." It was Jon's hope that students would see how the application related art and physics, and use this to fuel their own brainstorming about math and other subjects discussed at the table groups. While I

had seen Jon teach the lesson, I wanted him to describe what he wanted the lesson and project to look like, especially considering the unexpected circumstances.

The Reality

Jon explained that he was expecting sixteen students to participate at once, not thirty-five. But both the third and fourth grade classes were going to do the same project, regardless of whether he introduced it to the students altogether or separately, "So in a way it kind of helped me from having to watch the same clip twice in a row." Jon explained he generally likes to give lessons to the fourth-grade class first, so he can make adjustments before teaching the third-graders, who tended to need more individual attention. "Basically there were twice as many people as there should've been so I couldn't troubleshoot on-the-fly like I normally would've," he said.

With the increase in the number of students, Jon's strategy for using the iPad was forced to change. "My original plan was to have the iPad stay in the room and quickly tap kids that looked less engaged and send them to work with the iPad and then go back and kind of use it as a springboard to understand what the projects were," Jon described. "But, with so many people, I couldn't have as much movement within the classroom as I would've liked. So you know, I had to send, a couple of small groups out and then I couldn't really facilitate them and answer their questions about the iPad, even though it's pretty self-explanatory." Jon was confident in his technology natives, but had wanted to use the iPad with those who were struggling with generating examples, rather than those who were nearby. He did mention he used the iPad later in other lessons with his students in smaller groups with better success. Overall, Jon did not seem disappointed with how the lesson had gone.

Future Resources

Since this experience using mobile technology and museum resources was positive, I was curious to know what other online resources Jon had discovered while preparing for this lesson. I hoped by hearing about other resources that I would learn what specific traits or content in online resources would be significant for museums to consider when developing online resources. Jon described a mobile application he thought was from the St. Louis Art Museum that enabled the user to flip the architecture to see the dome opening and closing. Jon could use it to explore geometry, or "If I was teaching seventh- or eighth-grade physics or wanting to build structures in architecture," he said excitedly. The application featured real world examples while relating to classroom curriculum. Jon seemed to want learning to relate to something tangible for students, rather than a list of abstract concepts.

Intel Webinars and the Importance of Collaboration

Jon and I finished our conversation by talking about a note I wrote at the end of our last interview that read "Intel Monthly Museum Webinar." "Could you tell me a little bit about what the Intel Webinar was like and all about?" I asked. Jon went on to explain that Intel hosted a site called Engage, which is a "social network for teachers and it's all geared towards engaging teachers with technology." I remembered this from our previous conversation. He described one of the resources they provided a webinar focused on virtual museum resources hosted by Tom Diener, an educational technology consultant and Teachers Engage Museum Expert. The webinar is now called Museum and Makers Webinars, and while occurring less frequently, also include makerspaces[7]. In each webinar, a new museum or makerspace is featured, in which Diener introduces the

[7] Makerspaces are community spaces where "people gather to share resources and knowledge, work on projects, network, and build" (Educause, 2013).

museum and invites someone from the organization to talk "about the different apps and resources that they have available for virtual tours and for school groups that can actually come to the museum." Since Engage is a worldwide teaching community, it is valuable for teachers to know about both in-person and virtual experiences and resources. Jon described that the webinar is dedicated to teachers, "100% devoted to introducing teachers to what's available and getting them in touch with people who were working in museums for contacts, questions, and, [how] to use the resources that are out there." I admitted I had never heard of the webinar, but I thought it was helpful for museum staff to be able to engage with classroom teachers through an online resource.

"The Engage website is really awesome," Jon said. At the time of our interview, Engage was hosting a contest called App Slam!, "where teachers are basically trying to one up each other talking about what cool app they have been using lately." Teachers are even rewarded for their input. "I think a guy just won a 2-in-1[8] for talking about what he thought was an important ideal to teach students about," Jon described. Plus, it is something Jon can stay involved in without taking time out from other parts of his life. "I don't want to check Facebook at school," he saids, "so I don't feel bad logging on and spending 10 minutes on [Engage]. It feels like I'm on a social network and I'm checking in. I'm looking at messages and things, but it's all school focus and I get really good ideas."

This sharing of ideas with other teachers is important to Jon's career and habits of teaching. Whether through Engage or in person with other teachers at ADS, Jon feels collaboration is key to successful teaching. "It's really easy to get stuck in your own world as a teacher," Jon explained, "So when you can actually collaborate and bounce

[8] A 2-in-1 is a piece of mobile technology that can convert from a tablet into a laptop, and visa versa.

ideas off of somebody else, it's going to have an exponential effect." He goes on to explain collaboration is not only helpful for teachers to practice, but also for students to do the same. "I like seeing kids have to think about how different students work with each other and having to navigate through that," he said, "because really that's probably the most important skill you can teach, other than to be able to communicate."

My list of questions to ask Jon had come to an end. I stopped to think about whether I had anything else I wanted to know from him, but at the time nothing more came to mind. I thanked Jon again for his time, and left late that Sunday night.

MY REFLECTION

From our first interview, I recognized Jon's technical aptitude, so I did not expect his teaching philosophy and practice to be significantly affected by this study. There were still details I found valuable throughout his experience, though. This lesson was his students' first with the iPad, and his previous technology practice in the classroom prepared them to handle the tablet with respect and ease. In other words, his own Technological Pedagogical Knowledge meant he communicated his expectations with technology effectively enough that his students were prepared when a new piece of technology came into the fold. Jon's lesson plan focused on the practical brainstorming elements, while the underlying task would be for students to create an argument and defend it. This played to Jon's strengths as a history teacher, well-versed in creating and defending theses. I found it significant that during Jon's planning process, he used a museum webinar to find additional resources, some of which he hopes to use in the future. Observing and working with Jon informed my understanding of how to integrate technology as a piece of a larger project. As I moved to working with my second teaching

participant, June, I would be given the opportunity to see how mobile technology could be used as the centerpiece of an art lesson, including a virtual trip to the galleries.

CONCLUSION

My time with Jon was largely spent listening and observing. Jon's years of experience with teaching with technology meant there was much I could learn from talking with him and watching him teach. As I reflected previously, Jon's lesson was an example of how mobile technology and an art museum resource could work together to supplement a larger project. I wondered how *Physics in the Art Museum* was intended to be used, and how those who developed it would react to how Jon used it here. This debate between intention and actual use would continue on in my head as my attention shifted to working with June. The next chapter describes the experience June and I had working together to find a mobile application for use in her kindergarten art classroom.

Chapter 6: June

My role in working with June was a much different experience than working with Jon. Where he had significant training from museums, school districts, and technology companies for integrating technology, June admittedly did not. She was, however, an art educator whose prior educational experiences and diverse background informed her curriculum content and subsequent dedication to fostering creativity in her classroom. As a researcher, I was excited to have such contrasting cases, given one educator with experience using mobile technology in the classroom and another without. I hoped to find technological methods or resources for both novice and experienced educators. June, like Jon, had agreed to participate in two interviews with me, keeping a journal, writing a lesson plan, and allowing me to observe her teach the lesson in a class. Throughout our conversations, the written artifacts I collected, and my observations, I sought information about how June chose her lesson's online art museum resource and integrated it with mobile technology into her curriculum. In addition, I wanted to know how she would utilize her previous knowledge of pedagogy, technology, and subject content in teaching this lesson.

I have organized this chapter to present all the data I collected through my interactions with June, with my own reflections written in-between some sections. First, I explain how she became involved in the study, then transition into talking about our first interview. Here, I learned about June's past experience in art education and what brought her to teaching in the classroom. We also discussed her familiarity with mobile technology. Then, I tell the story of my two days of observations in June's kindergarten art classroom. June taught six classes over these two days, and rather than delineate each class individually, I have instead included the accounts of two classes in particular: the

first class on May 27th and the second class on May 28th. Pairs of students shared an iPad to explore the National Gallery of Art's mobile application, *NGAkids Art Zone* (*NGAkids*) (2014). Our last interview included her reflections about this teaching experience with the iPads and the NGA mobile application.

GETTING STARTED

Jon recruited June, a fellow teacher at Austin Discovery School, for my study. I have little knowledge of how he asked her to participate or what reservations she may have had, though her almost immediate agreement was a positive sign. June and I talked over the phone prior to our first interview. I wanted to make sure she was willing to agree to the interviews, journal, and observations, but I also felt the need to establish a rapport with her directly and answer any questions she might have about my study. She called me on the phone mid-morning during one of her preparation periods. Her passion for art and art education were evident from our very first conversation. June was friendly and upbeat, yet there was a sense of hesitation in her voice. As it turned out, she was finishing her own thesis for my same Art Education program at UT, and would be graduating in a few weeks. And, while June had a strong art background, she stated clearly that she had little experience with iPads or any other mobile technology. I could sense she was unsure whether she was a good fit for the research, since it revolved around using mobile technology in her classroom, and she had never before used it in her classroom. I emphasized there was no experience requirement, and I was happy to give her any training on the iPad itself, help her find a resource for her classroom, and be available for any and all questions she may have. I could even bring a set of iPads into the classroom to use with her students, including one that she could practice with before the lesson. It helped that I explained my past as an Apple trainer and technician, and she seemed

comfortable since I had prior experience teaching and troubleshooting with iPads. It was important to me that she knew I was there to give as much help as she may need, while making it clear that I respected her expertise in her classroom, curriculum, and with her students. June taught both kindergarten art and 7th grade eco-wellness (which she described to me as "basically gardening"). We agreed the art class would make the most sense for integrating art museum resources and using the iPad. She would need time to grow comfortable using the iPad, and she was unsure what topic she would cover with the iPads. June also expressed she was unsure where to begin to look for resources, so I offered to help. While she was free to use any kind of online resource as long as it could be accessed on mobile technology, once I mentioned the iPad, we both agreed a mobile application would make the most sense. I wanted her to have as much time as she needed to grow comfortable with the iPad while also planning a lesson, so I offered to do some research to find mobile applications for her. We would meet briefly when I was on the ADS campus for Jon's observation, when I could deliver the iPad pre-loaded with applications and accessories.

TECHNOLOGY CONSULTANT

In creating the list of potential museum applications for June, I was serving as a pseudo-technology consultant. I did my own research to find as many different applications produced by museums that I thought might be age-appropriate for her students. I searched for art or museum applications in the Apple App Store, using search phrases such as "art," "museum," and "creating." I tried to focus on those that were strictly produced by art museums, though I unintentionally downloaded several that were not. I looked at the National Art Education Association's (NAEA) Visual Arts Standards (2015) for kindergarten to get an idea of what types of skills and experiences were

required of this age group. I found these easier to understand compared to the Texas Essential Knowledge and Skills (TEKS) (2015), partially due to the ease with which I could navigate the chart provided online by NAEA, versus the list format used by the TEKS. I downloaded over twenty different applications onto the iPad June would be using, as well as gave a written list describing whether the applications offered art making, art games, or museum tours. Some of the applications leaned more towards serving as a substitute for art making and others looked to supplement art looking, and I wanted June to decide what curricular goals she could accomplish with the applications. My aim in giving the list alongside the iPad itself was to offer as much information for June to be able to make a decision and determine what would be appropriate for the students without her having to spend considerable time doing research. Curating this list was not only enjoyable for me, but also turned out to be one of June's most prized take-aways from this experience.

June and I expected to meet briefly while I was on campus conducting my observation of Jon's lesson so I could give her the iPad and list. June's excitement and nervousness were apparent as I placed the iPad, charging accessories, and printed list of applications into her hands. She assured me she would be in touch when she had the lesson planned. I reiterated she should let me know if any questions arose. Several weeks later, June emailed me. We solidified dates for our first interview and in-class observations. Instead of Jon's one class of third and fourth graders, June saw six different classes of kindergarten students. She offered to let me watch as many or as few classes as I wanted. It was important for me to be available for any technical help June could need, even if I would be there for some "stumbling," as June called it, so I agreed to observe all six classes. A few days before our interview, June emailed to say she had decided on an application, the National Gallery of Art's *Kids ArtZone*, and forwarded me a copy of both

her lesson plan and journal. I will describe the application at length in another section. I asked her to keep the journal as a means to understand how she chose the application she would use, so it included notes about the applications she tried from the list and her reaction to them. This journal would show me the details I overlooked in formulating the list. As I did with Jon, I waited to do an in-depth look at the lesson plan until after the first interview, so I could first hear about her teaching philosophy. We decided to meet for the first interview on May 26, 2015, which was the Tuesday afternoon before she would give her first lesson.

THE FIRST INTERVIEW

I met June in her classroom just after 3:00pm on our specified Tuesday. Her classroom was filled with bright natural light coming from two large windows on the far wall. The classroom also had tables grouped in the same configuration as Jon's classroom, though, here, the desks lined the edges of the room to leave a large open space in the center. Long pieces of masking tape placed along the floor formed a semicircle facing the chalk board, which was wiped clean. This was clearly an art room. The bookshelves featured reusable paint containers placed alongside books, the walls were covered with student artwork, and even the stool at the front of the room held a large block of clay sealed in a plastic bag. Elements of gardening were apparent, too, with a line of soiled shoes and tools near the door and prints of plants surrounding the curtain-less windows. A soft cushion and a hand-written sign designated a "safe space," isolated from the business of the rest of the room. June's desk sat to the right of the door, adorned with a cup of pencils and photographs of her children and husband, next to piles of school documents and her opened laptop. I came prepared to interview her with the same list of

questions I had asked Jon. I handed June a copy to look over while I set up the recording applications on my iPhone and iPad.

The Road to Teaching

June looked over the list of questions, her face showing her intent focus. We settled in on either side of her desk with the iPhone and iPad between us. She set the list down just as I pulled out my own. We were ready to begin. "So, do you want to tell me a little bit about your teaching career and your teaching philosophy?" I started. June cleared her throat as she started to tell me her story.

June earned her undergraduate degree in Art Education at the University of Wisconsin, Madison. After college, June explored many different facets of informal teaching, from environmental education in Texas to art, dance, and metalworking in a Mexican camp she directed. Briefly, she managed a project in landscape architecture and advised students about studying abroad in South America. "So, still within arts," June said of these experiences, "and I really have discovered along the way that the arts and teaching people about the arts happens in all ways and forums." She paused. "But I eventually felt like I was really, really far away from what I wanted to do and it had been time to basically come back. So I started getting my masters' in Art Education." She hesitated again, seemingly contemplating how much to say. "I could tell you all of my different jobs," she said with a laugh, explaining that while she was enrolled in her master's program, she "was doing a lot of managing of arts projects, like in nonprofits." One of these non-profit organizations was the Thinkery, an Austin area children's museum. Within this time, she also started a family. "And, then, this opportunity came up to work in a school, but I haven't really done that before. I had never really thought that I would, but it was really very family-friendly as far as my career and my new life

with my children." With many years of art teaching experience in informal settings already, June moved into classroom teaching. This switch allowed her to explore an area of art education she had yet to encounter.

"Fostering Creativity"

June continued by answering the second half of my first question regarding her teaching philosophy. She described how her interest in people's creativity and her current position in formal education go hand-in-hand:

> My main focus is fostering creativity. What's neat about working the schools versus drop-in programs, is that I have the same group of students. And, drop-in programs you might have some regulars that come weekly or biweekly, but you're not really designing programs that are necessarily building on themselves. But with the school, I'm really enjoying being able to craft it so that curriculum builds upon itself. That's really important for me.

June said she aimed to foster her students' creativity without being too open-ended or too confining. "In my classroom, I don't just say, 'just create!'" she joked, laughing and throwing her hands in the air. "But, what I like to do is give challenges and give a framework or container for them to think about or push up against." June uses the example of the expressive self-portraits that line her classroom walls, and motions towards them. "What would be interesting to represent the students?" she wondered. "Did they want their hair brown like it's really brown? Or, are they feeling cool and calm? Are they going to have blue and green hair?" June wanted her students to explore their own reactions and emotions through their artistic choices. Additionally, she mentioned she wanted her students to learn more about "the world and them in connection to nature," so many of her art lessons also include a concept from ecological literacy, which she refers to as eco-literacy. Eco-literacy promotes the understanding of

how the natural world is organized and how nature can be used to promote a sustainable human society.

June continued without prompting to talk about the TEKS. Her tone became matter-of-fact. “I do look at the TEKS, but I don't lean on them,” she stated, referring to the state standards called, the Texas Essential Knowledge and Skills. “That, to me, is important. I want to make sure that we are hitting the key ideas, but I'm not focusing on just teaching to the TEKS. We touch on all of them and it's fine.” Our conversation shifted to talking about how her lessons change over time.

June emphasized that her curriculum is not static. “I’m definitely flexible with how I’m moving forward with each class,” she said. June is unafraid to move and shift plans as she goes through a class. She described how much of her planning occurs when she sits down and reviews the spreadsheet of her curriculum, thinking “did that really work?” At ADS, art is a “Specials” class instead of a core class, so she can teach across many grade levels in the same subject, as opposed to teaching a single grade level in the same subject. One aspect of being a “Specials” teacher is the fact that she gets many opportunities to teach the same lesson, so “There’s a lot of action research happening,” she said, referring to the practice of consciously reflecting and adjusting teaching plans from one class to another. In the context of my study, this fact may prove helpful. She would be teaching with a new tool, and would, hopefully, feel comfortable making adjustments as needed. But, before we moved forward, I wanted to hear June describe her experiences with mobile technology.

“On the beginner level”

June described herself as a “casual user” of mobile technology. She uses a smartphone, but did not “have a ton of apps,” she explained. “I’m on the beginner level,”

she said with a laugh. While there were opportunities for June to obtain professional development incorporating iPads, like at the National Art Education Association's annual conference, she disregarded them because her school did not have iPads. "I don't have that and can't imagine ever getting that," June recalled thinking, "so I glazed over it when those topics came up." She mentioned it would be valuable to her to have the experience of using iPads in her classroom through my thesis. "So, maybe this might give me more ability to write a grant in the future because I might actually have some knowledge for how I might use it in my classroom," she said optimistically. As far as her students using the iPads, June was hardly worried about how the kindergarteners would get along with the technology. "Some of these kids probably spend a lot more time than I ever in my whole life will be on an iPad. So we'll see," she said with a laugh. "That's interesting to me to watch what they do. It's likely a lot more intuitive [for them] than what it was for me." June continued to developed her skills with iPads, though she used other mobile technology in her classroom frequently.

Online Resources to "get them excited"

June described how she used her laptop to find resources online for class throughout the school year. Recently, she used a video when introducing a lesson on self-portraits. In the video, an artist presented one of Van Gogh's self-portraits, and used technology to imitate what the painting would look like if he removed a single paint stroke at a time. One by one, many of the Impressionistic strokes were removed, leaving a picture-like image behind. "He erased some of his gestures and marks to where it looked like it was a photograph of him [Van Gogh]," June recounted, "I thought that that was an interesting thing for the kids to see because they're on the other side of that. They were themselves, and how are they going to create marks to make a self-portrait of

themselves?" There were other videos she used to help explore artistic concepts or techniques. She mentioned a music video from the band OK-GO, where they use costumes and props to create visual illusions that explore color blending and patterns. "Things that are short are a great way to capture the students and get them excited, specially if there's a song attached," she added.

In addition to YouTube videos, June also uses blogs, like Deep Space Sparkle, The Art of Education, and Pinterest. "I generally try to use Pinterest as inspiration," June clarified, rather than borrowing pre-existing lesson plans. She also uses Google to find images for artists or artwork for lessons. "Since I've got the Elmo," she said, motioning towards her Elmo overhead projector, "I can just project them up," from her computer. How to use the iPad with her class, though, seemed a separate challenge altogether. Rather than wait to use the iPads during the lesson I would observe, June decided do a quick test run with her students.

Early Practice

June described a time where one of the applications on the iPad related to a concept she was working on with her students, so she decided to find out how her students would respond to the iPad on her own. "I experimented a little," she admitted. "We were doing pinch pots. I used one of the apps to show the kids a Mayan Codex from, I think, the Kimbell Art Museum." She described how she held up the iPad for her students to see, and how they crowded around her to get a better view of the screen. "It was just small and it would be better to have been larger, or it would've been better had they all have their own." Several aspects about using the iPad in her classroom became evident through this impromptu practice. First, June now knew her students would likely prefer to be able to interact with the iPad directly, rather than crowd around a single

tablet at the front of the room. Second, June began asking herself what she was interested in seeing the students do with the iPads, whether that meant play games, learn about art history, or create artworks of their own.

Figure 3: Introduction page for *NGAkids Art Zone* application (NGA, 2014).

She ultimately decided to combine these interests for the lesson I would observe. June chose the National Gallery of Art's *NGAkids Art Zone* application to mix the experience of a virtual museum visit with art making, while exploring the styles of artistic periods. The application invited its young users to "Explore portrait, landscape, still-life, and abstract paintings in the National Gallery of Art and create your own works of art" (NGA, 2014) (Figure 3). Students could view paintings inspired by famous artists or movements in the virtual gallery, then edit those artworks to create their own piece of art. "I'm really most interested in observing the students manipulating things and touching and playing with it [the iPad]," June explained. Enabling her students to create a

virtual artwork would provide a stark contrast to an in-person museum visit when students are not allowed to touch anything they see. “But when you’re able to virtually go to this museum then play around with this stuff, I'm curious about what would come of that. Will they go crazy and not be able to focus? Or will they be really quiet and having fun?” June pondered. She was also curious to find out how well the students would share the iPads, since I only had access to eight tablets for sixteen children. This made June a bit nervous, but also gave her helpful information. “So now that if I do end up writing a grant for iPads or suggesting to the school that we need them,” June said, “I'll know if we should order one for every child or if it's okay to share. I'll be more informed.”

The curricular goal for the May 27th and May 28th lessons was to introduce the ADS Summer Art Challenge, which is “just something to keep things going and thinking about art in the break. Also, to give their parents some ideas to keep them not necessarily *just* to playing with their iPad?” she said with a laugh, realizing the irony of encouraging them to make art on the iPads in class. The Summer Art Challenge is a list of art related activities the students could complete over the summer. One of the challenges on the list was to visit a museum, so as a group they would “visit” a museum virtually in class with the iPads. June explained she would first introduce the Summer Art Challenge, then introduce the application as a way to practice one of the challenges. She would demonstrate to the students how to edit the artworks first, then “let them just kind of play with the other artworks and see what happens.” With a clear vision of what to expect the next day, June and I concluded our interview, looking forward to meeting again the following morning.

MY REFLECTION

June's informal education experience intrigued me. Creating curriculum and giving lessons in a formal classroom certainly differed from a drop-in structure, and I wondered if I would notice any pedagogical habits in her classroom teaching from this informal education past. Her philosophy in teaching supported her broad world view, connecting students not only to themselves and their creativity, but also to the natural world around them. She mentioned changing lessons from one class to another as if it were something she accomplished with ease. This flexibility could prove useful during the course of these observations, especially since this was the first opportunity the students had with iPads in her classroom.

While June described herself as a beginner, she seemed to use her technology skills to connect online curriculum resources into her classroom frequently. Her use of the Elmo to share contemporary photos and videos connected to the students' projects hardly seemed like that of a technology beginner. Her use of music videos to energize her student's creativity suggests she uses a wide variety of content, as well. I was impressed that she used the iPad in class to test her students' reaction. To me, this showed curiosity and bravery, as well as a desire to be prepared for the lesson I would observe. Her TPACK may be stronger than she initially believed. I turned my attention towards the journal and lesson plan June sent me. Looking forward to the lesson, I was eager to see not only how the students responded to the iPads, but also if and how June's teaching goal of fostering creativity would be enabled by the iPads and *NGAkids* application.

JUNE'S JOURNAL, THE APPLICATION, AND THE LESSON PLAN

I asked June to keep a journal as she used the iPad applications. She submitted it to be with her lesson plan, so I began first by reading her journal (Appendix G) to understand more clearly how she chose which application she would use. In a typed

response to the list of applications, June outlined her thought process as she chose an application. She detailed her own tinkering with each application, including several examples of applications she tested with the students already. She wrote, "I wasn't sure how I was going to approach this lesson as a very novice iPad user. I wanted to experiment with the different ways that I could use this tool," but within the needs of the curriculum. That week she had planned on talking about the ADS Summer Art Challenge (Appendix F). "I was hoping to tie in the challenge and the technology," she explained.

June reviewed nine different applications and tested two of them with her students. Several of the applications she looked at seemed valuable, but for older students. For example, the application *Art Cloud* was "tempting" to use because it would engage her students, but due to the inclusion of nude paintings, was not worth the "excitement this causes in the classroom." Other applications were too mature in terms of reading ability. An application from the Museum of Modern Art, had interesting interactivity, but there was too much text. "For non-readers (kinders) it wasn't going to work for me," June wrote. There were several that she did not find helpful because she simply could not understand that the purpose was, such as the *Museum of London Street Museum* application, about which she simply wrote "Didn't get it."

The application June described testing with her students was titled *Kimball Art Museum* (2014). The application provided a tour aid, including audio clips, videos, and thumbnail photos. She also found a video about pinch pots, which was perfect for her classroom project about them. For this day, June "decided to show them the Codex-Style Vase with two Scenes of Pawahtun Instructing Scribes and let them listen to most of the audio." Having the video was helpful for her, because she could "pause the audio to show them what the art historian was talking about." This was compared to another application from the Getty, which she opted not to use despite it featuring pinch pots too, because it

did not have any audio and it was "very difficult to show the entire class an image with only one iPad."

Another application June considered using was from the Portland Art Museum show *Feast and Famine* (2014). She went as far as to brainstorm a lesson plan for her students to explore "the idea of visual feast." They would explore the application and talk with one another, then have them create a dinner scene where they "create their favorite meal in some medium for their place setting." One of the artworks, however, was too gruesome for the young students. "I can't tell if you can hide images on any of these apps," she wrote, "but it would be cool to pick and choose what the kids see." Without the ability to hide images she felt were too strong for her students, June opted not to use this application.

June continued to explore some of the art making and art game applications from the list. Searching the art games, she found one she felt lent itself well to partners, since the students would not be able to work individually. "*NGAkids* seemed like a really fun option of being able to virtually bring my students to a museum (One of the Art Summer Challenges!) and also let them create," she wrote, adding, "I think I landed on my curriculum piece." Once June had determined which application she would use, she created a formal lesson plan around connecting the *NGAkids Art Zone* and the Summer Art Challenge (Appendix G). She sent me this and a copy of the ADS Summer Art Challenge assignment sheet (Appendix F) for reference, through email. Her lesson plan was divided by headings, including her art objectives, vocabulary, materials, instructional resources, and then the process and script she would use to teach the lesson. The art objectives were to talk about the summer art challenge and museums. The application was an instructional resource that offered a digital art outing, while giving students the chance to virtually paint and touch art in the museum. June would walk the students

through how to work in pairs with the iPad and how to make the American Folk Art Avatar that would be their virtual tour guide. She then planned to show them how to edit a collage inspired by artist Robert Rauschenberg, explaining how he "picked up trash and found objects that interested him on the streets of New York City and brought these back to his studio where they could become integrated into his work." After this, students would work in pairs to explore the landscape, seascape, still life, and Abstract Expressionist pieces featured in the virtual gallery.

MY REFLECTION

June's journal revealed her rationale for selecting the mobile application she would use alerted me to practical considerations teachers must take into account when picking digital resources. For example, some content, such as paintings with nudity, while full of artistic value, would be inappropriate for younger grade levels. The ability to hide or disable such content would be helpful for teachers to utilize content-rich resources with mature themes. I could not think of any application on the list I provided to June that had such an option. Also, for June's target age group in particular, finding an application that did not rely on written text was important. Minimizing the amount of text for non-readers was also a detail I had not considered when researching applications. It was a sign of June's strong TPACK that she identified these issues with the mobile applications, since she knew they would be detrimental to her class' function. In retrospect, I might have thought to arrange the applications by age or grade level, which would have helped me omit ones with a mature content or reading level that would be inappropriate for kindergarteners. It was not only important that the application's content offer educationally rich material, but also be age appropriate. June also pointed out other applications on the list whose function was confusing, so she spent little time trying to

figure them out. Especially for teachers with little free time, I can understand how if an application is not intuitive, they would be quick to move on to something else.

Having looked through all the applications June rejected, I moved my attention to the application she did choose, considering how it would work with her students. She chose the *NGAKids Art Zone* (National Gallery of Art, 2014) application, which invites students to explore a series of paintings from different time periods and genres. The cartoonish design and application's name clearly define this application for a child's use. When the application is first launched, it opens to a written invitation to explore the National Gallery of Art through this digital experience. This is some of the only text in the application, and I would be eager to see if the students overlooked it altogether. Designed to replicate a physical gallery, the application's layout is divided by several rooms/galleries, each featuring a different style of artwork.

Application visitors are encouraged to first meet and design their tour guide/avatar. The avatar begins as a young girl from a folk painting, but through a toolbox of different outfits, hair styles, and body parts, users can modify the tour guide into an animal or other cartoon. Once their tour guide is set, virtual visitors can begin exploring the gallery. From landscapes to seascapes to portraits to abstract paintings, each artwork was inspired by an artist of that genre or style. Rather than including digital reproductions of strictly famous pieces, the application features paintings inspired by well-known artists. For example, the Robert Rauschenberg collage June mentioned in her lesson plan was not a digital replica of an actual work of his, but rather one inspired by him for the application's users to manipulate. Just as the users could completely change the appearance of their tour guide, they could similarly edit the artwork in each virtual gallery. Once the students select a painting to open, a toolbox appears, and students are invited to move the people, animals, and objects in the painting (Figure 4). Some features

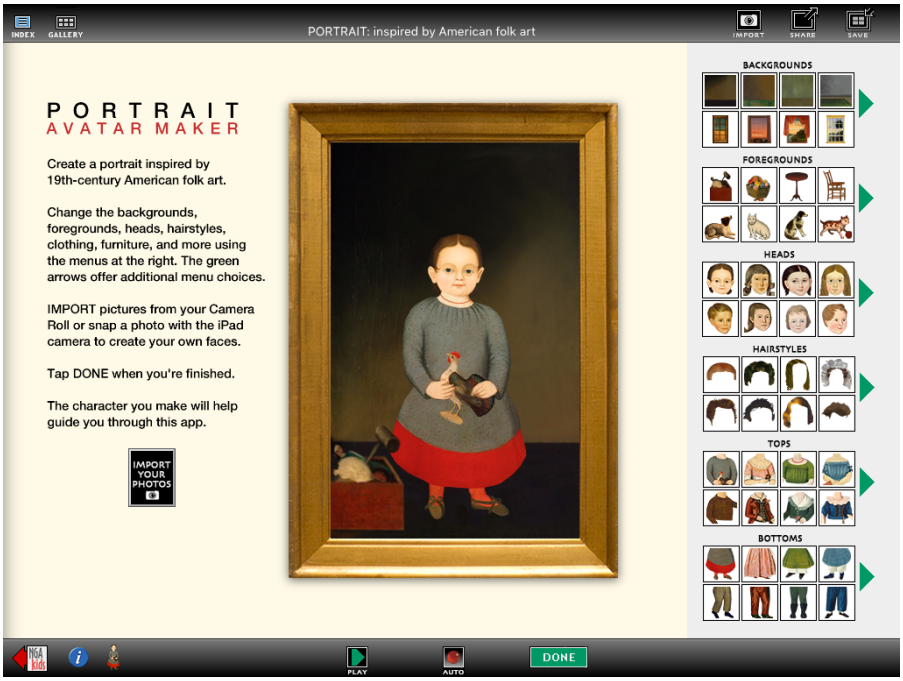

Figure 4: American Folk Art Avatar

add noises, such as animal sounds, waves crashing, and port bells, depending on the artwork chosen. There is an option to save the work, enabling each student to keep their own version of these famous paintings. The application could lend itself to a guided survey of different types of paintings, or as a more self-guided exploration of the paintings themselves. June's journal gave me a clear view into the positives and negatives of the application list, while her lesson plan laid out exactly how she would use the application she chose with her class.

The lesson plan began with introducing the Summer Art Challenge and talking about museums, then creating artwork with the iPads. June connects the iPad activity with one of the Summer Art Challenges, visiting a museum. The objectives of the class session were to discuss the Summer Art Challenge and to interact about museums, so the

key vocabulary word in her lesson plan was "museums." She emphasized how visiting a museum virtually offers a different type of experience than visiting one in person, but can sometimes be beneficial for times when visiting the museum is out of reach. In person, students would look and talk about the paintings. June's lesson built up the use of the iPads to do something the students normally would never be able to do while visiting a painting in person: manipulate and change a famous painting. June planned to first demonstrate how to edit the avatar by sharing with a volunteer partner, then dividing the students into pairs so they could continue to edit more paintings. I was curious to know how June would harness the students' excitement about working on the iPads until they were able to use the device themselves.

When June and I talked about her students using the iPads, she expressed some concern. And while I could not control their reaction, I could use my own technology knowledge in preparing the iPads to avoid any glitches that could make the lesson more difficult than it needed to be. For each iPad, I wanted to prevent anything changing without the student expecting it to, like the volume or orientation, so I adjusted each device's settings. I intentionally set the volume down to about 25%, so if some students found the sound elements in the application, it would not be overwhelmingly distracting to others. I also locked the tablets to a landscape orientation, since the application we were using worked best in the horizontal. The *NGAKids* application was already the only application on the home page, so students would know which to use. I could not remove the iPad's password because of the university's security settings, therefore I needed to give each set of students the password when they received the tablet. As each pair of students came to get their iPad, I would show them the password and the application we were using. They would need the password to use the iPad, so I counted on each of them to pay close attention to this detail. At the time, I could not think of any other

preparations for the iPads. In a few short hours, I would be in June's classroom and the trio of lessons would begin.

JUNE'S OBSERVATION: WEDNESDAY, MAY 27, 2015, 11:45 AM

I observed three classes on May 27th and three classes on May 28th. I have chosen two specific classes from each of those days to delineate because they encapsulate June's experience over the two days. Below is my descriptions of the first class on May 27th, which was June's first full class using iPads and online museum resources with her students.

iPads with Kindergarteners, or Sharing 101

June's classroom was dark and quiet when I stepped in it the Wednesday morning of May 27th. The fluorescent lights were off; only the peaceful sunlight from the cloudy day seeped in through the window. There were no students in the room, and June closed a plastic container as I walked in. She must have been finishing her lunch break. "I was just texting you!" June said, standing up to give me a hug. "The kids will be here in a few minutes." I sensed she was worried about what could happen if I had missed the class, since I had the iPads in a bag over my shoulder.

I pulled my phone from my purse. "I'm so sorry! I was signing in at the front," I explained, gently setting down my phone and the large bag of iPads. With only a few minutes before the students would arrive, June and I arranged our tools while we discussed details. I began stacking the iPads onto June's desk. We agreed I should observe the introduction and hand out the iPads to the student pairs from behind her desk, and then move about the class if I needed to. June looked a bit nervous, frequently checking the time on her phone and fidgeting with her iPad. I noticed the previously clean chalkboard was now divided into two columns, one side with rules about using

iPads and the other side introducing the Summer Art Challenge. Below the title of the challenge, June had listed three "levels" the students could achieve by completing a set number of challenges from the challenge list. I settled in behind the desk with my notepad and pen just as we heard students approaching from down the hall. I would be trying to write down as much dialogue and detail as possible, since I found this information lacking in my observation notes from Jon's lesson.

A quiet knock also set the door ajar, the voices from the hallway filling the room. The students had also just finished lunch, and were full of energy. June stepped into the hallway, loudly praising those who were quietly in line. Quickly, the rest of the students lowered their voices. June brought her own volume down to a whisper, as she instructed them to walk into the classroom quietly and sit on the semicircle. The students filed in one-by-one, sitting along a peeling, curved line of tape around the center of the room. Many of the students walked by slowly, peering at me over the stack of iPads on their way to the semicircle.

Once the students were seated and relatively calm, June introduced me. "Today, we have a special friend in class," she began. "She works at a place I bet a lot of you have been to. Who has visited the Thinkery?" The young students erupted. "Raise your hands if you have," June called. Nearly the entire class raised their hands, continuing to chat excitedly to one another. "Well, my friend Miss Kim works there. Can we wave hello to Miss Kim?" Sixteen tiny students waved towards me, some getting onto their knees to get a better look. I waved back and said, "Hey guys," in my kid-friendly voice. "Miss Kim brought us some special tools to make art with today," June continued, attempting to shift their attention back to her. She described the ADS Summer Art Challenge as a list of art-related challenges the students could accomplish over the summer. Throughout the summer, June explained, she wanted her students to keep thinking and working with art,

so the Summer Art Challenge was a way to keep creativity flowing until the students started first grade next school year. One of the challenges was to take an art outing, June explained, so we would practice that in class today by using an iPad to go to a museum. The murmur of excitement grew among the students once again.

"What's an app?" June asked her students. Many students raised their hands, and June called on a few of them. One described apps as games, while another told a story of the favorite app they play on their parent's phone. By the number of hands raised, it seemed clear that most of the students had previously used either a tablet or a smartphone. June explained they would have the chance to use an app, but first they needed to create rules about how to treat the iPads. June read the rules from the board aloud, ensuring her students agreed to them as she moved along. The students would work in pairs, which meant they needed to take turns. All water bottles should be put away. The students nodded in agreement. The last rule read "Respect = ?" June asked her students what it would mean to respect the iPads. "Should we handle them carefully?" June prompted after a moment of silence. Many students agreed, with one remarking, "Don't drop it, or it will explode!" To avoid dropping the iPad at all, the students agree the iPad should stay on the table. Now that the rules were set in place, it was time to introduce the application itself.

June sat on her knees with her students as she opened the *NGAKids* application. "What do we see in an art gallery?" June asked. Some students raised their hands, others shouted out "art!" June explained the students would use the application to walk through the art gallery. She asked for a partner to demonstrate how they should share the iPad. June chose a student sitting quietly with his hand raised, and he walked around the circle to stand next to her. June tapped the first piece of artwork, the portrait of a small girl painted in an American folk art style, bringing the piece forward and providing a toolbar

of options. June explained that the students can begin by changing this piece of art, from the background and foreground to the character's face and clothing. She paused. "What is a foreground?" June asked her students. She called on two students, neither of whom could define it fully. She defined the art term, using an example from the portrait she was editing on the iPad. June moved to role playing how the students should share the iPads, with June editing one detail of the artwork, handing the iPad to her student partner who then edited another detail, and so on. Many of the students shifted onto their knees to see over one another, the semicircle all but forgotten. June placed the iPad behind her back as she asked the students to "check their bodies," meaning to sit back into the semicircle and be sure everyone had ample personal space. The students adjusted, and June continued on. In pairs, the students would, "play with art pieces in the museum," June described. She then excused the students in pairs to retrieve iPads from me.

As I handed each pair of students an iPad, I showed them the passcode to unlock it and the application they would be working with, then I let them know to ask me if they had any questions. Most students were excited to begin working with the iPads and did not have any questions, instead carefully walking with the device to their table groups. Before long the room was buzzing with the sound of students working energetically. Just as the last group sat down to begin editing their artworks, a brown-haired boy walked into the classroom. June partnered him with a young girl who was working alone at the far right table group. June then pulled her phone out of her pocket, tapped the screen a few times, and put it back away. I would learn later she set alarms to remind her when it was time for the class to switch from art making to art sharing. June moved around the room, praising students who were sharing well. Some students had questions about what some buttons in the toolbox do, while others are tapping away. "So you can use this button to

change the color or size," June explained to a pair of students, pointing to buttons in the toolbox. "Now see what changes you'd like to make."

June began walking from table group to table group, asking questions. "Tell me about your friend here," she inquired of one student, about the portrait of the small girl. "Is this a seascape or a landscape?" June asked another pair of students, pointing to the seascape on their iPad screen. They paused for a moment, until one of them said, "A seascape! They're in a boat." June smiled as she moved to another group. While it had been difficult to give a lesson about artistic vocabulary at the beginning of class, I could see June attempting to integrate it while the students worked. I could also hear her reminding groups, "You do one thing, then your partner does another." Several groups asked to trade partners, to which June agreed. "Miss," a student from across the room called out. "Can we save our art?" June looked up first at the student then over to me. "Let's look and see," she replied, walking over to use the student's iPad. At June's desk, I opened my own iPad to check. Before I could load the application, June called for the class' attention as she walked to the front of the room. She described the save button in the upper right hand corner of each toolbox, and students should save their artwork to the iPads. On the board she drew a save button in the upper right corner. June directed the students to keep working. Soon I heard her ask a pair of students, "Why did you choose to do it that way versus how it was before?" The students explained they wanted to add more people to the painting, and found an illustration of George Washington they could add to their piece, and he would dance when prompted. Hidden throughout the application were unexpected and fun options, which the students appeared to enjoy.

Most students went back to work after June explained how to save, except for a young girl at the far right table, who had been partnered with the boy who came in late. Her partner was eagerly tapping away on the iPad, his shoulders hunched over the tablet

and his body angled away from her. The young girl stood up from her chair and walked to a large floor pillow in the back of the room, below a handwritten sign indicating "safe space." June noticed her move, and walked over to talk with her. Kneeling down, she asked the student why she did not want to participate. The young girl explained her partner was not sharing. June stood up with the young girl and walked her back over to her table group. Speaking to the brown-haired boy, June explained, "I don't think you're doing a lot of sharing, so Christina[9] needs some time by herself. You can watch while she plays." June removed the iPad from in front of the boy and placed it in front of Christina. The young boy looked disappointed to have to stop, but he stayed nearby and watched Christina play anyway. Most students were working together without problems. Some students were even getting up from their seats to show friends at other tables how to use features. June continued to walk from table to table, until her phone alarm rang. She held the phone up so her students could hear it chime. She announced to the students they should stop working and move to the semicircle so everyone could share their work with one another.

Several students followed these directions, but many more did not. Even after June praised those who moved to the semicircle quickly, several students continued playing on the iPads at the tables. June called these students by name, asking them to move back to the floor with their iPads. Many of the students moved as they were asked, but some continued to play with the devices while on the floor. June announced she would like everyone to stop working on the iPads, so some classmates could share their work with the group. "Place the iPads flat on the floor," June instructed. Again, several followed directions, and others did not. "The iPads should be on the ground with

[9] Pseudonym used.

nobody's hands on them," June said again. "It's hard to stop because we've had so much fun making them, but we need to give attention to our classmates."

June asked each pair of students to pick one of their paintings to share and talk about with the class. "Who had a seascape?" June asked, and several students raised their hands. She called on one student, who held her iPad to show the class the seascape she and her partner had created. "What's the difference between a seascape and a landscape?" June asked the girl. The student explained that seascapes were paintings of water while landscapes were paintings of land. June praised her answer, then asked her what was in the background of her painting. The student described the far-off boats, using her fingers to zoom into the image, enlarging the boats for her classmates to see. June thanked her for sharing, and again reminded students they were to be watching their classmates, not playing on the iPads. "Hands should be on your knees," June announced as a second group began to present their artwork. Students in the back continued to tap their iPads. During this second presentation, June quietly walked around the circle and collected iPads, placing them in a pile on her desk. As she did this, June realized it was time for the students to head back to their homeroom. She thanked those who presented, and reminded the students they would be able to accomplish art challenges all summer long. She excused the students two at a time to line up at the door and many of them thanked me on their way out.

Throughout the three classes June taught May 27th, she adjusted her lesson plan to reflect a slightly different approach. During the second class, June opted to have the students leave their iPads at the tables during the presentations at the end of the class period. And while there were no iPads to distract the students during show and tell, many of them were still unsettled, fidgeting and unfocused. For the last class, June opted not to introduce the Summer Art Challenge at all, instead inviting students on an imaginary trip

to Washington, DC. The students closed their eyes and June narrated them through an imaginary plane ride, ending at the National Gallery of Art. June focused much more on the types of paintings the application offered, describing and presenting examples of folk art, landscapes, and seascapes to the students. At one point, she turned the lights off, which aided students in seeing their iPads and also brought a sense of serenity to the room. Each class of students was slightly different, and it was hard to tell exactly how June felt about the way the day had gone. We did not have a formal interview that afternoon, though we exchanged first impressions. "All things considered," I said with an encouraging smile, "that went well!" June gave a relieved laugh, thanking me for the encouragement. I could tell the lesson was not quite how she was used to her classes going, but there was still a second day to try again.

MY REFLECTION

By the end of that first day, my hand was tired from writing and my brain was buzzing, but I truly believed what I told June. Nothing had gone horribly wrong, and the students were interacting with art and artistic vocabulary in a playful manner. June stuck to her lesson plan fairly closely throughout each of her three classes, though there were some groups whose joy and enthusiasm were more difficult to contain than others. Two factors that always drew excitement, and thus a loss of control, were the visual of the iPads as the students walked into the classroom and June's introduction of me as someone who worked at the Thinkery. The students knew the iPads were there for them to use, so most students struggled to pay attention with this distraction. They all seemed to know how to use the tablets, as they had used them before, but this was the first time in a class, so they did not have an expectation for how they should behave. Also, most of the students had likely visited the Thinkery either with their families (the museum is about

two miles from the school) or visited on a school tour, and a mention of this caused a stir among the students as well. While it seemed clever to mention that I worked at a museum since the class was about museums, I wondered how June could tell the students without losing their focus.

Additionally, the issues of sharing were persistent across each class. This was the first kind of mobile technology the students had ever used in class, and we expected a certain amount of excitement to stem from this. They shared other materials throughout the year, though they never had to share their own canvases. I wondered how June would approach solving this problem in tomorrow's classes. It was also difficult to get students to stop playing with their iPads while seated in the semicircle during the show-and-tell portion at the end of class. June made an pedagogical adjustment in the last class, asking the students to leave their iPad on the table instead of bringing it with them to the floor. More of the students' enthusiasm shifted to wanting to present rather than wanting to continue to edit their paintings.

A few activities I found to be very successful were the imaginary trip to Washington, DC and how the students contributed to the rule list. It seemed to be a successful means of getting the students to imagine what it would feel like to transport themselves out the classroom and to the museum. The students were also interested in developing the class rule list, even though June already had the rules listed on the chalkboard. Asking them to come up with their own could be a way to communicate the rules June had already written on the board, while also acknowledging the students' opinions. While some parts of the lesson had gone well and others were less effective, it would be up to June to make any changes. To my surprise, I received an altered lesson plan in my email later that night.

JUNE'S LESSON PLAN, VERSION 2.0

June emailed me a new lesson plan late Wednesday night (Appendix H). The majority of the lesson remained the same. The objective of the lesson would still be to discuss the Summer Art Challenge and museums. Students would still be exploring the *NGAkids* application and taking the virtual trip to Washington DC, but June added more focused procedures and resources. She included more vocabulary: landscape, seascape, and still life. She also incorporated a children's book, *Fancy Nancy at the Museum*. In her lesson's introduction, June added an emphasis for the group to focus on "creating our OWN art in the museum." The save feature was also added to the lesson plan, as were the established iPad rules. She omitted the explanation about Rauschenberg, while adding that the last ten minutes would be dedicated to sharing what students had learned with one another at their table groups. The class would no longer come back together on the semicircle at the end of the period, but rather share what they had learned with their table groups. Many of the changes June made seemed to reflect an interest in including art vocabulary more directly, though I also saw her making changes to address the behavior issues she witnessed. We would not know how effective the changes would be until my observations on Thursday.

JUNE'S OBSERVATION, THURSDAY MAY 28, 12:40 PM

The clouds were rolling in throughout the Texas afternoon, with the normally bright sunshine coming and going through the windows. The classroom lights were turned off for the afternoon and the room felt cool and calm. June had just seen her first class of the day, whose instruction followed the lesson plan she sent me. When I asked her about adding the book, June told me she had emailed the librarian for book recommendations, which is where the suggestion for *Fancy Nancy* originated. June commonly read books to her classes, and she considered bringing in this familiar practice

to align the iPad lesson more closely to what her students would expect. The librarian gave her several options, including *Olivia* by Ian Falconer, *Seen Art?* by Jon Scleszka and Lane Smith, and *Fancy Nancy at the Museum* by Jane O'Connor, each relating to art and museums. June chose to read selections of *Fancy Nancy*, since the students would recognize her from the *Fancy Nancy* book series.

As the voices of students in the hallway became louder, June stood up to walk towards the door. "I know I'm not supposed to have favorites," she whispered to me as she stepped by, "but this class is my favorite." June opened the door to greet the group of students, who quickly became silent. She asked the students to take a seat on the semicircle, welcoming them inside as they quietly filed into the classroom. Some waved or said hello to me as they entered, though most were calm and hushed. June closed the classroom door after the last student, and soon the entire group was seated on the floor. June started by introducing me to the class as her friend Miss Kim, who brought special tools to make art. Despite the fact that the students could see the iPads, June did not refer to the tablets by name. "Hey guys!" I said, in the same playful voice, waving my hand. Some waved and several said hello back. "So, class, after today, we only have one more class together," June began. "But, I don't want you to forget about art over summer, so today I want to introduce you to the annual ADS Summer Art Challenge! Who can tell me what a challenge is?" she asked. June and her students discussed the Art Challenge, and June gave some examples of the types of challenges the students would be able to achieve over the summer. To get the students ready, though, June explained the students would be practicing a few of the challenges from the list.

June pulled the *Fancy Nancy* book from behind her chair. Some students moved forward with excitement, while most whispered to one another. June explained quickly that we would be joining Nancy on her school's trip to the art gallery. June opened the

book to her paper clipped page, and read through several pages. In the book, Nancy narrates her walk through the gallery, explaining why she loves all of the masterpieces on the walls, including the "paintings of trees and lakes," which "are called landscapes." the "paintings of flowers and bowls of fruit," which "are called still lifes," and the "painting of a person," which is "called a portrait," (O'Connor, 2008, pp. 23-25). June read only these few pages, closing the book and asking her students to take their own imaginary trip to the art gallery with her. First, the students would need to board the imaginary bus. "Close your eyes," June instructed. "We are taking our bus into the air, flying over Florida, then up to where our president lives! Who can tell me where our president lives?" "Washington, DC!" called out several students, opening their eyes. June laughed and opened back to the page in *Fancy Nancy*. "So now that we are in our own art gallery, what is a painting of land called?" "A landscape!" answered several students. June reviewed each type of painting again, soon switching to introduce the iPad portion of the lesson.

"Miss Kim brought us a set of iPads," June began, motioning towards me, "and they have an app called the *NGAkids Art Zone*. You will each get a chance to create some of these types of masterpieces Nancy was just looking at. But first, what are some rules for using iPads?" June did not reference the rules she had written on the board, but rather called on students with their hands up. "Use two hands!" called out one student, whose neighbor added, "Be careful with it." June reiterated the students would be working in pairs, so she reminded them to "take turns." She also went on to alert them this was the only application they should be working with, so "remember, our job today is to stay in this app," she said. "Now, show me your hand if you've ever been to an art museum," June called. Many students raised their hands. "Can you draw, erase, or touch the

paintings?" June asked. "No," the students responded in unison. "In this application, we can," she said.

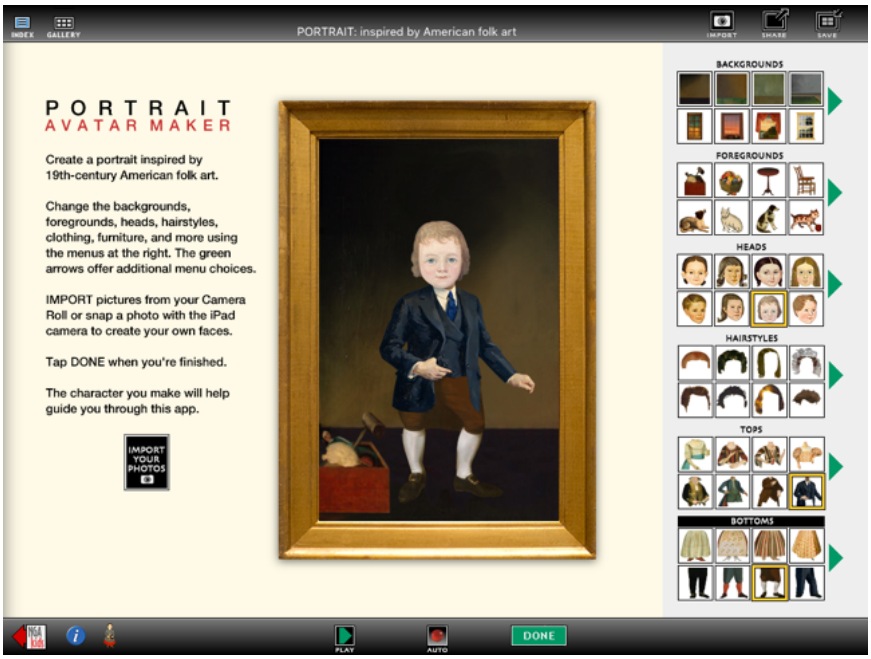

Figure 5: Portrait of young girl edited by ADS student

June selected a boy near the front to be her partner, and he stood to join her before the rest of the class. June held the iPad up for the class to see, demonstrating how she could tap a portrait of a young girl in a red dress, which brought up an editing toolbar along the right side (Figure 4). She made a few edits to the young girl's portrait, then handed the iPad to her partner, emphasizing aloud that the students should edit a few parts, then share. June described aloud the options for editing the background and foreground of the portrait. After a few edits, June pressed a button and the character, who now had a young boy's face and an older man's clothes, began to dance, which made all of the students laugh.

"Now, if I want to save our portrait," June instructed, over giggles and laughter, "I will use this square in the right corner. And if you forget, just look up here," she said, indicating to where she had drawn the square on the board. The students were still attentive, so June clicked to a second painting, this one of an abstract artwork. She clicked into a second toolbar, where options to create new and different types of lines appeared. "And if I create a mark I don't like," June explained, "I can use this red arrow to remove it." The students began to stir, so June quickly explained how the end of class would work. "When the timer goes off," she said, raising her phone into the air, "you will leave your iPad on your table and come back to take a seat. I will choose a few iPads and some of us will get to share what we have made with the class."

June quickly paired the students, who walked to retrieve their iPads from me. The volume level and orientation should have already been locked from the last class, I thought, as I gave each pair of students the passcode to the tablet. Before the last group sat down with their iPad, students were already calling June over to answer questions. "How do you get rid of something you don't want?" a pair asked. "Let me show you," responded June, eager to share her knowledge. After working with this pair, June walked between the tables for a few minutes, glancing over the shoulders of her students. "Remember to save the artwork you are really excited about," she called out. "Look at ours!" a student seated to my right said, looking up to June as she passed by. "Wow!" June commented. "Are you working on a seascape or a landscape?" she asked. "I don't know," the student replied with a sheepish grin. June asked him a few questions about what was in his painting, from the boats to the lighthouse, and the student came to the conclusion that he was working with a seascape. "That's right," June replied, standing up. "Keep working hard and don't forget to share!"

Dull sounds of seagulls and port bells came from the far left corner of the classroom. I realized suddenly that one group during the last class had found the sound options in the application and turned up the volume on their iPad, but I forgot to turn it down before handing their iPad out to the next class. June and I looked to one another, but neither of us walked towards the table. I continued taking notes from June's desk, and she continued walking around the room. "Let's work on the landscape!" said the boy to my right, loudly. The volume in the room gradually grew louder. I could see the boys in the far left corner turned around to the group next to them, and soon there were more sound effects throughout the room. "It was a nice experiment," June said to me quietly with a laugh, "but I prefer the music off." June asked the students at the corner table to use the bottom button on the left side of the iPad to turn the volume down, she then thanked them for following directions.

"I will be coming around and switching up partners," June announced. "If you are the person working with the iPad when I come by and pick it up, follow your iPad to your new table group." She moved four or five partner groups, including several from the left corner. Once June was satisfied with the new groups, and the room's volume had decreased dramatically, she took a moment to thank a table group of students. "You are all working together really well," June said. "Thank you." She looked to a pair at the table. "So show me some of the things you've made." The pair showed her how they changed the portrait of the young girl to now feature several animals piled high in the foreground. June laughed with them, while also encouraging them to try to manipulate other artworks as well. I noticed she did not refer to them by the style of paintings, as she had yesterday, but just referred to them as "other artworks." Just then, June's phone chimed.

June held her phone in the air. “This chime means you have five more minutes,” she announced. I walked through the class for this last five minutes, taking very few notes. The students were working excitedly, sharing when they came upon new or unexpected features. Some realized it was possible to have the seascape animate, with waves coming upon the shore and boats rocking in the distance. The pair next to them took the animation one step further, making a boat sink in the foreground. Before we knew it, June’s phone chimed again. June held the phone in the air, the chime continuing. Some students looked up, while others tried to fit in a few last edits. “Hands off your iPads,” June announced. “Leave them on your table and head to sit down on the floor.” Only one table did not follow directions the first time, though after June called them by name, the students left the iPad on the table and sat on the floor. June sat at the front of the semicircle in a chair.

“Show me with your hands,” she began, lifting two thumbs up, “if you enjoyed working with the iPads today.” All but three students have both thumbs up, the other three with their thumbs to the side, indicating they had an okay time working with the iPads. “And who worked with the seascape?” June asked. Ten students moved their thumbs up. “What do you remember most about working with the landscape?” she asked. “The yellow button!” one responded. June looked confused, so the child explained the yellow button was what you could use to create lightning in the ocean. “Great, thank you for sharing,” June said. “Who worked with the landscape?” Not many students responded, prompting June to follow up, “The painting with the land?” Eight students moved their thumbs up. “What do you remember?” June asked. “The animals!” a student replied. “And who worked with a still life?” June continued. None of the students responded. “Or, what is a still life?” she asked. One student asked if the painting of the flowers counts as a still life, which June confirmed. Several more students put their

thumbs up. “And what about the folk art?” June asked. None of the students responded, many giving one another confused looks. “The one with the little girl?” June prompted. All of the students raise their thumbs. June checked her watch, realizing it was time for the students to head back to their homeroom. She asked them to thank me for bringing the iPads on their way to line up at the door. Shortly thereafter, the room was free of students once again.

June taught this lesson two other times that day, and each of them were slightly different. In her first class of the day, June kept the lights off to encourage a more calm classroom environment, which seemed effective. She read more of *Fancy Nancy* in this class, integrating the imaginary bus ride with Nancy’s bus ride in the book. This class did, however, have difficulty coming back to the circle at the end of the period. In her last class, June opted to leave out *Fancy Nancy* altogether. Instead, she decided to mix in the art vocabulary while teaching the students how to use the application. Students in all the classes seemed to enjoy their art lesson, and I looked forward to hearing how June would react to the final day of observations.

MY REFLECTION

The most notable changes in June’s second day of teaching this lesson were the impact of including the *Fancy Nancy* book and the emphasis on added artistic vocabulary. The book aided the imaginary trip, and many of the students seemed to recognize the character. The effectiveness of the additional artistic vocabulary could be argued either way, though her second class seemed to gain the most familiarity with the terms. While I watched June make many efforts to integrate the vocabulary, I wondered what else could be done to cement this into the lesson. Could this application be used at a different point in a lesson cycle, to serve as an assessment of the vocabulary students

retained, rather than at the introduction? Would the students more easily recall what the vocabulary meant if the application were used as a review? I also wondered how many paintings each student worked on. There were at least a few students who worked on only one painting and created several different versions of it, instead of exploring the other paintings. If the goal had been to use each different style of painting, I wondered how a teacher could be sure her students visited each one. In June's lesson, including the circle at the end of class gave her an opportunity to recap the vocabulary students used in the application, even if not all the students had made it to those paintings. Yet, this part of the lesson was omitted in the document June sent me the evening before. I was eager to hear how June felt about the last two days of observations, and luckily for me I would not need to wait very long, since we decided to conduct the last interview immediately after classes on May 28th.

JUNE'S SECOND INTERVIEW: MAY 28TH

A New Medium

June and I settled into our seats on either side of her desk, with the iPad and iPhone flat on the table between us. We decided to conduct our interview shortly after the last student left for the day, while it was still fresh in our minds. I gave her a copy of the list of questions I had prepared, just as we had done for our first interview. When she finished reading over them, I started the recordings. To begin, I wanted to hear June compare this lesson to a typical new art lesson. "So the unique situation here is this is literally the first time I have ever used this medium," June said laughing, referring to the iPad. Before becoming involved with this study, neither she nor her students had used iPads in her art classroom. June was learning how to be comfortable using the iPad at the same time as she was learning how to teach with it, which she found challenging. "There

was a learning curve," June explained. The first day was uncomfortable, more so than any other brand new lesson. By the second day, however, she said she, "felt a lot more confident. I kind of understood what might come up" in terms of challenges with technology. Like any lesson, once June identified problems, she could begin to explore how she could negate them.

In fact, keeping the students engaged with the application was the easy part. "Funniest thing," June recalled, "the hardest thing was sharing." Not only was the technology exciting to them, but they were actively creating while sharing. "They [iPads] are made for independent use," she explained, "and we were asking a lot of kindergarteners to take turns, to interrupt their flow to invite somebody else into that flow. That's a challenge." Interrupting creative flow as a behavioral concern was something I had not even considered as a part of the sharing aspect. "We had a couple of meltdowns and sadnesses because I was asking them to share in a different way than they ever have to," June described, sympathetic to her students' reactions. It was her awareness of her student's expectations and experience that drove her to change her lesson plan after the first day of observations.

A Different Role

June recognized how drastically different the iPad lesson and a regular lesson in her art classroom were, and that was what motivated the overnight lesson plan adjustment. She described this realignment as an effort "to be a little more comfortable for me, my teaching style, and [to mirror] what the kids have already experienced." For example, June had previously done a project with her students revolving around illustrator Eric Carle and his books. The students painted a creature that would be in one of their own books, which gave them a clear goal to achieve. In playing with the iPads

and manipulating the paintings, "there wasn't a goal to achieve," June explained. Including *Fancy Nancy* was one way to combat this open-ended feeling, but June worried there was not a sufficient framework for students to operate in like they, and she, were accustomed.

Even June's role as a teacher was different in this lesson. Rather than guiding her students' exploration, she explained, "I sat back and let them kind of experience the apps more. It's interesting to watch them!" Rather than giving instructions to clean brushes, hang paintings, and mind others, June found herself much less busy during this lesson. She instead spent much of the student exploration time watching her students, moving from table to table asking leading questions. Even with asking these questions and making the changes she did, though, she was still not completely satisfied with the way the lesson developed. "I'm not sure this reflected the best type of lesson that I've ever done," she expressed, "I don't know where exactly it [the lesson] fit in with everything I generally do." In the future she "would like to ensure the there was more art learning," she explained. During class, she made efforts to integrate art vocabulary, though dividing her students' attention from the iPads was difficult. If June were to repeat the lesson in the future, the issue with sharing would also need to be addressed. "Perhaps it would have all moved differently, if I had one [iPad] for every child?" she wondered. Without a doubt, though, she felt the lesson, "would continue to evolve."

In some ways, what June enjoyed about the application initially also defined what she did not like about how the lesson worked in class. Part of what attracted her to the application was the approachability of it. She said "It [the *NGAkids* app] really lent itself to just playing. The stakes weren't that high. You can start over really quickly." In the end, there was not enough art learning to satisfy her teaching goals, though she enjoyed watching her students work so intensely. "My guess was that they would really enjoy it,

and they did," she said with a laugh. "They ate it up. They were totally engaged and really excited about it." She had expected the students to enjoy working with the iPads, and they did. I thought back to the beginning of mine and June's conversations about working with iPads, and her telling me she had never received any training about how to use them. Yet, she had learned, largely on her own, how to conduct a lesson with them. If she could have received a formal training workshop, what would it have been like?

Learning the iPad Shuffle

"What would you like a training workshop for technology to look like for you?" I asked June, referring to her as an iPad beginner. For first time iPad users like her, June decided a training workshop about how to teach with mobile devices should be framed like an introductory dance class. "The first time you take a salsa class, you might learn the basics and then you might learn a sequence," she explained. "And so I think iPads are very intuitive and so the basics would be a very brief segment." Especially for a first time user, training would need to cover one specific application that would definitely work in the classroom:

> Now, this is much more formulaic than what an advanced or intermediate dancer would need. So, for me, if I was to really invest and take my time, my precious time, to do something outside of school, I would want something that's surefire. Like this will work. It touches on all of these standards, and its so creative, and the kids' minds would expand in this way. That's what I would want. And then within that, just like dancing, if you've learned a couple of moves, those are the basics…then I could go to this other app and feel comfortable because I already know the more basic one.

June connected the scaffolding of dance moves and sequences to how to teach teachers to use iPads in a way that first directs them concerning how to use the technology themselves, then gives them a tested example for their classrooms. June is a mother and a teacher, so her time outside school is incredibly valuable to her. Having a resource that is

reliable is important to her, especially when incorporating something so drastically new into her classroom. A training workshop would need to provide her with a concrete tool for her classroom, while arming her with the confidence to approach other technology tools as well.

Desired Features

Now that June was confident teaching with one application, I wondered whether she found any other potential resources during the study. She said the list of applications I created came to mind, since it was full of potential resources to use in her classroom. "It's nice to have a list of things that are like, 'these are worth going to,'" she said. "Even knowing of some site that says these [apps] are curated and approved," would be helpful, she commented. While June thought of some of the applications as potential resources, some would not be so, due to their nude content. "I really don't have a problem with nudity in general, like in fine art, but its just not even worth my time," in the classroom, June explained. Her students would be so distracted, it would be more of a detriment than a help for her class. One feature she would like to see is a "heads up about nudity, or be able to remove the images," to prevent classroom distractions. These suggestions seemed reasonable and manageable, I remember thinking. With that, my list of questions had come to an end, though I felt the need to ask her for any last thoughts.

"Is there anything else that you would want to add about what we've done this week?" I asked. The lesson was different each of the six times June taught it, each time tweaking it a bit more. "It didn't feel the same, it didn't feel super to me, but that's how it is in the beginning of everything," she reflected. It was also comforting to June "to know that if there were some technical difficulties, that you would be there to hold the fort." Regardless of having a technology expert in the room, June gained confidence throughout

the two days of using iPads in her classroom. “If anything…I was maybe a little, at the beginning, nervous when things weren’t quite going as right. It was like, ‘She’s going to write all about that!’” June recalled with a laugh. “But then, you know, even if that’s the case, it’s fine. That’s why we need to do this research.” June also commented that her relationship with technology changed from Wednesday morning to Thursday afternoon. “I think it was really just out of reach before. So, my perspective has changed. I can bring it into my classroom! It’s true!” she said. I thanked her, and she thanked me. Our lessons together were over.

MY REFLECTION

Reflecting only on our last interview was difficult, since in many ways, I wanted to begin looking back on our entire experience together. Specifically, during this last interview with June, though, I enjoyed listening to her reflect back on the experience of participating in my thesis. While she called herself a beginner when we started out, I could see June’s confidence with technology building from one day to the next. Her TPACK was indeed stronger than she initially thought. I also appreciated her calling iPads a new medium, because it brought the image of learning to paint or sketch for the first time to mind. Teaching with mobile technology would be a skill set June would continue to develop, and would be a bit different with every online resource she used. As she described, she had mastered one application and could bring her skills to other applications.

I would continue to analyze what from this study could be used by art museums to create substantial resources for elementary school teachers. After my final interview with June, though, I focused my attention on what I, as a museum educator and technologist, found meaningful throughout working with Jon and June. It became clear to me that I

served a different role for Jon than I did for June. The next section explores what I have learned by playing these roles with each teacher.

KIM

In the previous sections of this chapter, I have offered a reflection in between each event in the data collection with both Jon and June. I think it necessary, however, to look back with greater detail from my own perspective both as a museum educator and a technologist. Just as I aimed to tell the stories of Jon and June as participants, I will now tell my own story as I worked and learned alongside them. From the inception of this study, I wanted to offer as much or as little support to my participants as they needed. I prepared myself to help someone progress step-by-step, if that was what the participant required, though neither of my participants needed this much help. With Jon, I largely learned through hearing his past experiences and observing him teach. Conversely, I was more active in providing resources for June early on in the process and being available for troubleshooting during her class sessions, both of which were learning opportunities for me. To start my narrative, I begin with Jon, a largely self-sufficient educator with plenty of experience integrating technology into his classroom.

In Jon's case, I spent most of my time observing and learning from his experiences and example. I offered to help him find resources, provide hardware, or anything else he could think of that would assist him in developing this lesson, but he was largely already prepared. He had an idea of what he wanted to do and how he could accomplish it. Rather than write a brand new lesson, Jon chose to integrate a museum resource into a lesson he was already planning. I learned through our interview that he did some research when deciding which application to use, but his familiarity with technology in his classroom made him comfortable to add the iPad without concern.

Jon's familiarity was earned, though, through years of trial and error with technology in the classroom, and with some help along the way. Jon spoke highly of the professional development offered to him by previous historical associations, district technology consultants, and museums. He said most of these opportunities presented themselves through email, though we both wondered how his email address became available to those programs. Also, how could the organizers of said programs ensure they reached all teachers who could benefit from them? Leaving Jon's first interview, I recognized how valuable his years of teaching experience were to his confidence in the classroom, yet how deeply intertwined his core beliefs were to his curriculum.

Leading up to Jon's lesson, I realized my role for the remainder of our time together would be to observe. There were certain details I worried about (how would third and fourth graders deal with sharing an iPad?), though Jon's confidence told me I did not need to be concerned. During Jon's lesson, I saw him manage twice the number of students he normally manages, while transitioning between technology pieces. His technical fluency and command of his students helped keep these transitions from being disruptive. It seemed important to note these details since it was my impression that teachers were commonly worried about how to keep track of their students while still incorporating technology into their instruction. Jon kept students engaged by asking questions as he moved from one piece to another. We talked about his familiarity with technology in the classroom during our last interview, and he told me about some of the resources he used. Engage, an online community for teachers, proved to be a huge influence on Jon's technology use in the classroom, since he was able to share ideas with many other teachers simultaneously. This website, in addition to the Intel Museum Webinar that is hosted from it, were two resources I became aware of from Jon.

Ultimately, I learned from watching Jon teach, hearing about his past experiences, and from the resources he shared with me.

I was much more involved with the pre-preparation of June's lesson. It was important to me to give June as many resources and as much help as I could without overwhelming her or giving her the chance to learn for herself. Based on our phone conversation, it was clear she was more concerned with the time it would take for her to find a quality resource for her classroom than she was learning the device. I asked her to let me know if she would prefer for us to walk through how to use the iPad, but focused my attention on collecting an array of online museum resources. I originally began by downloading every application I could find to my personal iPad, though after some time realized I needed to be more selective about what I would download onto June's device. I evaluated each application as I downloaded it, and some would clearly not work for her classroom. Some required additional resources, like wifi, an overly large amount of downloaded content onto the iPad, or for the user to be located inside the museum. I was unclear at the time whether ADS had wifi, so it would be helpful for June to know if a function required it. Downloading large collection files to the devices would not necessarily prevent us from using an application, though it would take a significant amount of time to prepare this download for each tablet. Those applications meant to be used in the museum were easy to omit from the list since we would be using the application in the classroom, rather than through the gallery.

With these few parameters in mind, I set out to create a list of applications from which June could choose. I wanted to give her the option to use an application that let the students play, or one that was strictly academic. As a museum educator, especially given my current role at the Thinkery as an early childhood educator, I hoped June would choose a more playful experience for her youngsters. I included applications where they

could explore specific museums in a more traditional, object-centered way, as well as some they could use to create artwork. Once I decided which applications were feasible for classroom use, I downloaded them onto the iPad I would be giving to June. I organized them into folders on the iPad including art making, art looking, and art tours. It seemed most helpful to also include a written list with a description. On this list, I wrote what the user would do with the application, what artistic skills would be gained, and how it could be used in the classroom. I attached the list with the iPad and accessories, expecting June to contact me once she had a chance to review it.

June told me in our phone conversation that she had little experience using iPads, and did not own one herself. I provided the hardware with pre-loaded applications and offered to teach her how to use the iPad, but she taught herself. In the midst of planning curriculum, and completing her own thesis, as it turned out, June learned to use the iPad on her own time. She likely transferred skills from using her smartphone in order to maneuver through basic use of the iPad. Once she was comfortable using the device, June looked towards how she could use it in her classroom. The experiment to use the iPad in her class to show a video was equally significant, in both establishing her own confidence in using the technology, but also for making curricular decisions. By testing in class before writing her lesson plan, June was able to assess not only how her students reacted to seeing an iPad in class, but also how they could react to specific types of content. June could have chosen to use applications featuring photographs of artworks, videos of artists creating artwork, or applications enabling art making, all of which encourage different types of artistic skill. I considered how these applications fostered different artistic skills, and included this information alongside the list of applications.

June's journal gave me more insight into how teachers evaluate possible resources. She considered not only age, but also the amount of instructions that were text

based. Her notes largely commented on how well her students would react to the application and how usable the application appeared to be. It was easy to see how the application she ultimately chose aligned with her creative goals in the classroom. Jon used his chosen application as an example product his students could produce for their assignment. June, on the other hand, chose an application that would require creativity. Jon also chose to use his own iPad, thereby controlling how the device was managed beforehand, such as the volume, passcode lock, and the student's ability to access other applications. His students also had experience using the devices in the classroom. Since June's students were much younger and did not, I was careful to take a few precautions, including setting the volume to low and locking the orientation. I also knew students may be interested to see what else was on the iPad, so I moved all other applications to other pages of the iPad's home screen. This was a detail I knew I had the luxury to control, since most school tablets would store many applications for many teachers and classes. Especially since the students found the sound effects in the NGA application, it was beneficial that I set the volume to low, even though the students knew how to turn it up.

During the lessons, I again served much different functions for each teacher. For Jon's class I largely observed, taking notes from the couch. He adjusted his lesson plan to include a museum application, with his students viewing the application's content as an example of how they could complete the project. I was not needed for any troubleshooting. Even in June's class, I was available for any assistance, though I only received one request to fix an iPad. As brief as this help may have been, it had the potential to derail June as she focused on working with students, rather than centering attention on the hardware. The ability to troubleshoot on the fly is a multitasking skill that an educator likely develops over time, but that is why I offered to be in the classroom. I

wanted June to focus on working with the students and the technology, rather than have to worry about any technical issues. She will develop her own troubleshooting skills as she continues to use technology in her personal and professional life.

Even so, June showed she was learning more about the application the longer she used it. She learned and taught the students how to save their work as they created new pieces. When I asked her about how she would develop a training for other teachers to use technology in their classroom, she recommended starting with a brief tutorial of how to use the device, but emphasized the need to focus on one specific application. By focusing on one example of how the iPad could be used, teachers could walk away with a concrete way of successfully using the technology. This statement, in particular, struck me, because rather than arming teachers with broad skills they could apply and tailor to their curriculum, like I expected to be the best solution, June instead recommended first giving them a sure-fire example to copy. I would dwell on this statement as I began to look back on my thesis as a whole, on the hundreds of pages I read about technology integration in America and abroad, and on to that last interview in June's classroom.

It was significant to me, though not surprising, that I learned so much from both teachers. It was my intention that this project have a collaborative aspect so each of us could learn from one another, and I think this was especially true between myself and each of the teachers. Jon was well versed in using technology in his classroom, so I was able to hear about his first experiences, how he overcame them, and how those experiences helped him going forward. June had many years of experience in non-profits and teaching many different forms of art, so from her I was able to serve as a consultant and learn how to use art and technology simultaneously in the classroom. As I conclude this final data chapter, I begin to step back and look at what my experiences with these

teachers reveals about art museums, the online resources they use, and the teachers who implement them in their classroom.

CONCLUSION

After collecting, analyzing, and reflecting upon the data collected with Jon and June, I now turn towards describing what these stories mean and exactly what I found out from these experiences about mobile technology and online art museum resources. What I did not expect was all that I would learn about teachers and the practice of teaching, as well as the fascinating intersection art museums and mobile technology offer to this audience and their curriculum.

CONCLUSIONS

Chapter 7: Conclusions

The qualitative methods used in this study enable art museum educators and other interested educational stakeholders an opportunity to learn from two teachers' experiences using mobile technology and online museum resources in their classrooms. This final chapter of my thesis delivers the outcomes of the study, as well as suggestions for the art education field concerning the topics of technology integration, online museum resources, and the subsequent programming that could be developed for elementary educators. I begin by reviewing how I came to perform this research, what problems led me to conduct it, and the questions I sought to answer, which are followed by the methodologies I utilized. Then, I address the outcomes this study presented, as they pertain to both schools-based educators and art museum educators. I describe potential areas of future research that could be conducted concerning art museums, elementary teachers, and technology integration. Finally, I discuss this study's significance to the field of art education.

REVIEWING THE STUDY

In this study, I harnessed my skills as a technologist, art museum educator, and researcher to work with a pair of elementary school teachers to see how they would use mobile technology for integrating online museum resources in their curriculum. I provided as much or as little assistance as the teachers required, ultimately serving as a technology specialist for one and an observer for the other. Jon, an elementary math teacher, found an application where his students could view how physics is found in artworks. June, an elementary art specialist, chose an application from a list I provided (Appendix I). The application encouraged her kindergartners to manipulate artworks to

remix and create new pieces, exercising their creativity while learning artistic vocabulary. I observed and collected data outlining how each teacher used mobile technology to activate online art museum resources in their classroom. This data assisted in developing a case study about how 21st century learning is actively occurring in contemporary classrooms, and what role in this art museum resources are currently playing in developing elementary curriculum.

THE NEED FOR RESEARCH

The omnipresence of mobile technology and the Internet is without a doubt changing the way our society looks at how to obtain and interact with information. As we look forward to the future, we are inundated with predictions about how to best prepare today's students for tomorrow's realities. Collaborative efforts between community, government, education, and business leaders, such as the Partnership for 21st Century Learning, seek to bring together resources in and out of schools to ensure today's students are prepared for their rapidly developing futures (P21, 2015). Students today are used to constant access to information, so 21st century learning shifts the focus of classroom learning from the dissemination of facts to practical application, combining information, media, and technology skills with the need for global thinking, collaboration among students, and high order thinking. Along with these skills, 21st century learning acknowledges the need for learning outside of school, renewing focus on libraries and museums as educational partners (P21, 2015). Additionally, these new educational trends bring about pressure on school districts to keep up technologically, by replacing aging equipment with newer devices and upgrading the technical infrastructure of aging buildings to provide students with technological experiences and skills. New mobile technology tools such as smartphones, tablets, and laptop computers are becoming

commonplace for some districts. With these drastically new tools, though, also come the need for a shift in pedagogy, requiring teachers to adjust their teaching styles and methods as they incorporate these new tools (Dexter et al., 2000; Fisher et al., 2013). Research shows the training offered by some school districts is lacking; instead of showing teachers how to use the devices, teachers need assistance developing and adjusting curriculum to teaching with this new mobile tool (Benton, 2010; Koch, Heo & Kush, 2012).

Just as teachers work to adjust their curriculum for digital delivery, art museums are doing the same. Museums and libraries are similarly changing their own strategies to keep their educational resource offerings relevant by increasing the online resources available (Sayre & Wetterlund, 2009). For some museums, generally smaller museums, this digitization of lesson plans and previously printed educational content is the extent of their digital offerings. For large museums, though, the development of online multimedia experiences and downloadable mobile applications bring the content of the museum to wherever a mobile device is found (Sayre & Wetterlund, 2009). Users can browse a gallery virtually, or take a 360-degree tour of a sculpture from their tablet or phone. The educational function of these digital experiences has yet to be investigated in hands-on research, let alone in the elementary classroom. With the trend of educational technology bringing mobile devices into classrooms, the time would appear ripe for studying how online art museum materials are used by teachers in their classroom and with their students. What could be learned about technology integration, mobile technology, and art museum resources from observing elementary teachers as they implemented such tools? This would be a question that would lead me towards what would ultimately become the research question to guide this study.

THE RESEARCH QUESTION

With this question in mind, I began to ponder what more could enhance this study to be beneficial for the educators with whom I worked. It became clear that more than simply observing a teacher, it would be more insightful to work collaboratively with them. In chapter 4, I discussed the importance my sister Tara had on my research. I decided to approach the study as if the teacher I would work with was her, who had little experience integrating mobile technology or art museum resources into her curriculum. What kind of help could I offer this elementary teacher? How could I make her educational expertise heard? Keeping my sister in my mind, I realized a few key details about this study. I would need to work with two different teachers, one art specialist and one generalist teacher, in order to understand to what degree the content of art museum resources was applicable to other content areas. My sister taught Language Arts and rarely received development with arts resources. Additionally, I would work in collaboration with the teachers, providing any technological or museum-related assistance that would be necessary, while also giving the teachers the opportunity to exercise their own skills and knowledge. Ultimately, the study integrated many of these lingering questions into one main research question: In conducting a case study with one elementary school art specialist and one elementary level generalist classroom teacher, how do these teachers use mobile technology to integrate art museum resources into their curriculum and what can be drawn from this information that may assist art museums in providing substantive educational resources and programming for elementary school art instruction?

RESEARCH METHODOLOGY

As I attempt to answer this question, and the many more that have developed along the way, I have utilized qualitative research methods, focusing specifically on

facets of both case study and narrative methodologies. Each teacher agreed to the following participant criteria: engaging in two interviews with me, agreeing to create a lesson that utilized an online museum resource with mobile technology, permitting me to observe said lesson, and keeping a journal. These tools enabled me to hear from each teacher before, during, and after the lesson. Rather than report about each teacher, I chose to create a trio of narratives about our experiences. Such narrative enabled me to focus on the lived experiences of Jon, June, and myself, to find stories evoking values (Chase, 2003) that informed our decision-making. With this intention, I collected data through semi-structured interviews, from documents, and through classroom observations. June provided a written journal, while Jon did not. To supplement this omission, I asked Jon during his last interview to answer several additional questions reflecting on the process of creating a lesson integrating an online museum resource with mobile technology. Before constructing the narratives, I needed to analyze the collected data in a way that accounted for the different types of knowledge each of us brought to the teaching experience.

I chose to analyze the data through the lens of the TPACK (Mishra & Koehler, 2006); or Technological, Pedagogical, and Content Knowledge; teaching model. According to Mishra and Koehler (2006), an educator's teaching can be evaluated through several types of knowledge, in technology, pedagogy, or content, and how these areas of knowledge combine to form an integrated knowledge, such as technological pedagogical knowledge. In my study, I prioritized how each teacher used technology and how this impacted their pedagogy appropriately in order to teach with mobile devices.

The previous two chapters aimed at telling the stories of both participant teachers, with my own story intermingled, while applying the TPACK framework to my data analysis. The stories should function as parallel narratives of nearly the same story,

loosely in the vein of *Rashomon* (Jingo & Kurosawa, 1950). In that film, several different characters retell a story, each telling slightly different versions than the other. Each character recounts their recollections of the event to leave out details and often adjust the truth to hide guilt. Unlike in the film, I have drafted these stories to reflect the experiences of Jon, June, and myself. From these multiple perspectives comes a more complete version of our experiences together. And, now that the stories have been told, I aim to use the values and themes found within these stories to generate outcomes, as they are relevant to the educational field and art museum education.

RESEARCH OUTCOMES

In working with these teachers as they integrated online resources into their classroom curriculum using iPads, several important outcomes emerged:

1. Teachers are a valuable resource for museums developing materials for the classroom.
2. The intersection of art objects with mobile technology provides users with the capability to interact with artwork in ways not possible in the gallery.
3. Utilizing the features of mobile technology with art objects also has the potential to offer engaging, real-world curricular connections to many different subject areas.
4. Mobile technology offers a shared learning experience by transforming the learning environment, but there may be limitations concerning specific technology activities.
5. TPACK can be used to provide a much-needed objective view of a teacher's knowledge, and should be used in teacher training.

6. Teacher technology training must abide by the principles of andragogy to be successful.

Teachers in Research

One of the most significant outcomes of my study is how important Jon and June as teachers were to informing my research. It would have been possible to conduct this research without working so closely with the pair of teachers, opting to construct a survey or otherwise objective report of how they used the iPads and mobile applications. Instead, I chose to reflect and learn from Jon and June. Both possess teaching experience in the classroom that informs their ability to consider resources, make curricular decisions, and implement change. As a museum educator and technologist, I needed their perspective in order to have a clear understanding of what was possible and plausible within the classroom context. By working with the teachers directly, asking reflective questions and at times collaborating, I was able to gain a clearer understanding of the contexts in which each teacher operated. June, for example, wrote in her journal the thought process behind why she chose not to use some of the applications on the list I provided for her. Within her classroom context, applications that included too much written text or artworks with nudity could not be used because of the age of her students. I was able to understand the thought process behind how and why a teacher would choose one application over another, including the consideration of details I would not have thought about. Jon's years of experience in teaching with technology meant he had gathered his own resources along the way, and he informed me about the Intel Engage website and webinar. Since the site is geared directly towards teachers, I may have never stumbled upon this resource, despite the many thematic connections it has to this study. Especially in qualitative research, the inclusion of the teacher's perspective is essential in

understanding the nuances of behavior and choice. Bringing these authentic voices into the research fold in a more prominent way can only benefit classroom educators and all those who work to serve this audience.

Unique Experiences

Each in their own way, Jon and June selected and used applications that gave their students an experience with art they would not have been able to have in the gallery. The digital interaction with the art objects provided a more experiential learning encounter than simply viewing the artwork. Jon's students were brainstorming real-world examples to answer the question: is math discovered, invented, or both? To aid in their brainstorming, Jon brought in the *Physics at the Art Museum* mobile application, which provided videos and animation of art objects to describe how the artwork illustrated a concept of physics. If visiting in the galleries, Jon's students would not be able to see an animation of the statue *Diana* as she releases her arrow and falls backwards, demonstrating Newton's Laws of Motion. The application provides this unique experience, and gave students a concrete example from which they could continue brainstorming. Similarly, June's students used the *NGAKids Art Zone* application to take a virtual trip to the galleries. Unlike an in-person visit to the gallery, though, students could change and remix the paintings with the tap of their finger. Seascapes and landscapes could be accompanied by sound and movement, with the students deciding what details could be included or omitted. By rearranging and replacing components of the paintings, students could create new artwork and compositions in an entertaining and beneficial way.

Integrating Content Areas Through Art Museum Applications

Another outcome of this study is the potential found in combining art objects with mobile technology to offer engaging, real-world curricular connections to many different subject areas. Constructivism calls for thematic connections between subjects, rather than teaching school subjects in isolation, and this sentiment is echoed in research concerning STEM, STEAM, Arts Integration, and 21st century learning (Riley, 2013, 2014). Jon used the *Physics at the Art Museum* application to connect art objects to physics concepts, such as an ancient sword to illustrate the center of balance. And, while his students were not focused specifically on learning the physics vocabulary, the use of art objects to illustrate them provided the type of real-world connections needed for students to develop knowledge and understanding about abstract concepts. Not only does technology enable static images and figures to animate, but it enables students to erase the lines between what is art and what is science. June's use of *NGAKids Art Zone* in an art class did not directly address other subject areas, though students practiced skills and knowledge transfer across other subjects. Through editing different art pieces, the students learned about cause and effect as well as composition of artworks, in addition to collaboration and communication with others. It is these multiple entry points that make art objects ripe for integration with other subjects. Whether art objects are used to explore physics or artistic vocabulary, history or storytelling, embedding objects into curriculum blurs the lines of content to provide truly integrative learning. The inclusion of technology, as shown in this study, contributed an additional layer of interaction and thus understanding.

A Shared Learning Experience

Mobile devices are a unique learning tool: they are, subsequently, an individual-use device while lending themselves to collaboration through shared learning spaces.

Fisher et al. (2013) studied the phenomenon of shared learning spaces afforded by tablets such as iPads. In their study, students using iPads were more likely to share their knowledge with other students in comparison to students using laptop computers. In my study, students used iPads collaboratively in both classrooms, to different degrees of success. June's students paired up and took turns creating artwork on the same digital canvas. Some of her students became so engaged in creating artwork that they did not share with their partners, either accidentally or intentionally. In this instance, it appeared that the age or maturity level of the students and the nature of the mobile activity contributed to the degradation of the shared learning experience. Kindergarteners in general are learning the social skill of sharing, so this issue may not be unique to using the iPad. At the same time, other partner groups in June's class found it engaging to turn and share new details they had learned with other partner groups. It was common to see a pair of students reaching over to their neighbors' tablet to show them how to add in a new feature. Learning extended from one partner group's iPad to the other.

In comparison, Jon's students viewed the content on the iPad in groups of five or six, though their communication was less strenuous. Students communicated to one another their choice of mini-lesson to view, but ultimately each student had the same learning experience, free of social issues. Whether this is because of their age, maturity level, or the activity on the tablet is unknown, though it would be an interesting investigation for further studies. And despite some of June's students struggling to share, it is also significant to point out the conversational atmosphere presentin both classrooms. Both groups of students collaborated with one another to create knowledge together (Keengwe, et al., 2013), with little involvement from the teachers.

In each of these examples, the learning experience is centered on the student creating knowledge, rather than the teacher disseminating it. The knowledge and

understanding developed between the students and their technology tools. These interactive experiences enabled students to create a deeper knowledge and understanding than from viewing artwork alone (Nicaise & Barnes, 1996). Here, technology served as a "knowledge construction tool" for students (Karagiorgi & Symeou, 2005, p. 20). It is by interacting with one another and the application, which provides unique experiences with art objects, that students create knowledge. The position of the teacher had thus shifted from being the disseminator of knowledge to the gatekeeper of knowledge. Teachers are now responsible for learning how to use their own knowledge about technology, pedagogy, and content in new, intersecting ways.

TPACK and Classroom Management

When I began this study, I expected to use the TPACK, or Technological, Pedagogical, and Content Knowledge framework (Koehler, Mishra, & Cain, 2013) as a somewhat evaluative tool. Ultimately, though, this tool became useful in providing an objective understanding of how teachers could perceive their multiple types of knowledge. June described herself as a "novice iPad user," commenting that she was unfamiliar with mobile technology because she did not use a lot of apps on her phone. She lacked confidence going into the study because of this unfamiliarity with iPads, especially considering she would need to use it as a teaching tool while also managing her students during class time. In terms of TPACK, she seemed concerned about her Technological Pedagogical Knowledge, or TPK.

June took several steps to develop her skills in relation to her TPK, including testing different methods for using the iPad and supplementing it with classroom practices more familiar to her students. Weeks before the observation, she tested the iPad out as a video player to see if this is how she would incorporate the device.

Unfortunately, June's students would not sit still, especially since only a few could see the small screen. Because of this test, June knew she could not use just a video with her students; they would need to be more actively engaged. On the first day of my observations, June struggled to keep her students' attention at the beginning when she introduced the activity, and again at the conclusion of class while groups presented to one another. June recognized these classroom management issues, and re-wrote the lesson plan before the second observation day. She opted to incorporate an element more familiar to her students by reading the *Fancy Nancy* book. Since she and her students had read together in class before, the students knew the behavioral expectations of story time. To combat the disruption at the end of class, June also decided students would not carry their own iPad to the artwork presentation segment of class. These adjustments in TPK, by incorporating more familiar elements and adjusting the management of the iPads, likely contributed to June's success on the second day of my observations. Especially considering that much of the content knowledge was already integrated into the application June chose, the intersection of TPK seems to be of utmost importance when developing a teacher's skill set with technology, simply because it enables them to have a clear understanding of their own skills.

All too often, one's perception of their own skill leaves much to be desired. Because of her smart phone use, June possessed technological knowledge she could transfer to using the iPad. June's iPad test indicates the barrier for training teachers to use mobile devices is low in terms of hardware training, since much of it can be transferred from smartphone use. It would seem, then, that future teacher technology trainings could benefit from using a framework like TPACK in order to uncover the knowledge teachers already possess. Practicing the principles of andragogy as set out by Knowles and colleagues (1990, 1998) teachers may find value in incorporating

technology into their classroom. The TPACK framework helps make teachers aware of their potentially overlooked skills and how these skills can be applied in the classroom.

Andragogy and Teacher Training

Taking the principles of andragogy (Knowles, 1990; Knowles, et al., 1998) into account when developing teacher technology training is essential. During this study, Jon and June exemplified these principles and how they translate into meaningful change in teaching practice. Jon told me the story of receiving an iPad from his librarian when iPads first debuted, spending the summer learning what he could about the device and the resources available for it. It was having the knowledge that the device could be used in his classroom that answered his why, what, and how of learning how to use the device (Knowles, et al., 1998). For June, that answer came when she agreed to participate in this study. For both teachers, the connection between learning the iPad device and implementing it in their classroom was clear, which should be desired of any teacher training model. The second principle calls for a consideration of a learner's "self-concept" (Knowles, et al., 1998, p. 3). June is an example of how a learner's "self-concept" impacts their attitudes towards learning a new skill. Her self-concept was that she was a beginner who would need help, but in reality her skills from her mobile phone transferred to the iPad. The third principle of andragogy leans upon the experiences of the adult learners to guide future learning (Knowles, et al., 1998). Jon borrowed his experience of learning how to use the computers in the computer lab with his students in order to take the same "let's figure it out together" approach to the iPad. This lesson was the first time he used the iPad specifically in his classroom, but he borrowed from his own previous experiences to implement the new device. Andragogy's fourth principle lies in the need to contextualize learning in the adult learner's professional, personal,

and/or social life (Knowles, et al., 1998). Since June learned how to use the iPad for this class, the learning is anchored in her professional life, though skills from her personal and social life lent themselves to her learning the iPad. Finally, the fifth principle outlines the need for adults to understand how they would use what they are learning in their lives (Knowles, et al., 1998). June actively used the skills she was learning in her classroom. Because of June and Jon's example, I find it essential that any teacher training should mirror a similar adherence to the principles of andragogy. If technology will be necessary for a teacher's success in the classroom, the training offered should reflect what research finds to be most effective in helping teachers reach that success.

SUGGESTIONS TO THE FIELD

The second half of my research question aimed to explore what museums can learn from the way Jon and June used mobile technology, the iPads, in order to create substantive resources for elementary teachers. The following suggestions thus arise:

1. Collaborate with teachers and universities
2. Extend museum involvement to new technologies
3. Combine education and technology departments within museum institutions
4. Scaffold professional development for teachers

Involving Teachers and Universities

Teachers provide a wealth of experience and knowledge about curriculum and pedagogy as it is relates to today's classrooms. While many museum educators are former teachers, the classroom is a place of constant change and development. A part of an art museum's digital strategy should incorporate teacher recommendations wherever appropriate, such as in pre-development of teacher resources like websites, mobile applications, or curricular packets. When I created the list of applications for June, I

thought I knew what types of applications she would want or need. From her journal, I learned about features I had not even considered she would need, such as the ability to hide artwork with content too mature for her kindergarteners. Consulting with teachers, whether there is a committee of teacher advisors or a less formal network of educators, would contribute a contemporary teacher's perspective into museum resources. Teachers can help ensure the effectiveness and appropriateness of teacher materials for the classroom.

By taking advantage of educational technology programs at universities, art museum education staff may find assistance in developing resources with new technologies. *Physics in the Art Museum* itself reflects a much needed, real-world example of collaboration among a museum, university, and school teachers. Funded by a grant from tge Subaru of America Foundation, the application was developed by Mary Jo Grdina and Michel Miller of Drexel University's School of Education in collaboration with Barbara Bassett, Curator of Education, School, and Teacher Programs, as well as Steve Wills, director of the Wachovia Education Resource Center, both of the Philadelphia Museum of Art (McKechnie, 2014). The production of the application took place at Drexel's Learning Technologies Group within Drexel's School of Education. Leveraging each group's expertise enabled the two institutions to work together to develop a project that met each group's overall goals. University students were able to apply what they disovered about learning technologies into a usable product, while the museum gained an educational resource to share. Additionally, teachers and students in Philadelphia assisted by using an early version of the application and giving feedback to the project team. I find this type of collaboration beneficial for each stakeholder, from the museum education staff and the university professors with their students, to the teachers, and should be employed as an example of how to generate these types of 21st century

resources. The museum was able to provide use of their art objects as well as give input regarding what the modules should explore, while the university students received real-world applications of their educational technology curriculum. School teachers being involved in testing ensures the applications met the needs of classroom curriculum, while including the teacher's voice in its development. It is also worth noting that this application features a simple and effective design. Other than a few graphics, videos, and animations, the application does not strive for excellence visually. It is effective because of its focus on content, and was likely less complicated to make because of this. Mobile applications do not need to be cutting-edge or complicated, but rather need to provide learning experiences effectively. Art museums would benefit from partnering with institutions such as local universities, to provide real-world experiences for university students while also creating new digital materials for teachers.

Educational Technology Departments

As the need for educational technology projects increases, museums should consider investigating collaborative activities between once separate departments. While many museums use different titles for these types of departments, I suggest combining those staff responsible for educational content and those responsible for digital interpretation into a single Educational Technologies department. While there are tasks primarily for the education staff that may not include technology, and visa versa, it is clear the field is trending towards a combination of the two. A unified department could streamline goals for content use inside and outside of the museum. For example, interpretive content for use on iPads within the galleries could also be used through the museum's website to ensure visitors who are unable to visit the gallery can access the

same materials online. This type of collaboration would also enable the integration of school curriculum standards throughout the educational suite of resources.

Scaffolding Teacher Resources

In my conversations with June, I asked her what a teacher workshop for technology integration should look like. Her ideal teacher workshop would include a single, "surefire way" to integrate technology into curriculum. While I agree with her to an extent, my suggestion to those involved with technology integration is instead to offer scaffolded trainings for teachers. Throughout this study, I utilized the definition of technology integration as found in Koch, Heo, and Kush (2012):

> the use of technological tools in the classroom with an understanding of its relationship to pedagogy. That is, technology integration is part of the pedagogical process and instructional delivery of a set curriculum; technology does not cause learning, rather learning occurs due to effective teachers. (p. 2)

Key to defining technology integration is the understanding of using technology in relation to pedagogy and curriculum instruction. Since the presence of technology does not ensure success, but success is derived from effective teachers, it is of primary importance for the training of these teachers to build upon itself in a logical way. Researchers Hosman and Cvetanoska (2013) found that technology integration is a years-long process for teachers to implement. It would follow that the change towards using technology in the classroom is gradual, and it would benefit both technology specialists and teachers if the professional development offered were delivered in a way that began with basic skills. It would be appropriate to begin a set of professional development training sessions with the type suggested by June. As time goes on, with the appropriate amount of coaching and in-class support, educators could work together with specialists to adapt curriculum until they were comfortable on their own. This type of support is

clearly the ideal, but the main point should be the necessity for teachers to receive assistance adapting their curriculum to technology in a way that aids them in becoming confident, independent technology users.

Digital Strategy and New Technologies

Digital strategy for a museum should also aim to extend the museum's network to new technologies. In addition to maintaining a website with easy access to online lesson plans, multimedia content, and high-quality images, the teacher audience may benefit from a guide for how to use these tools. Either introducing them during on-site teacher workshops or providing a short video tutorial on the website's landing page could enhance teacher's use, and thus experience, with the resources. Taking advantage of webinars such as the Museum and Makers webinar from Engage would also be beneficial in extending the network of the museum beyond its normal reach. Jon found the *Physics at the Art Museum* application after participating in a Museum and Makers webinar, in addition to encountering several other applications he discussed wanting to use in the future. Websites like Engage provide a social network specifically for teachers, thus it makes sense for museums to promote and interact with teachers in this forum. The digital landscape offers museums the ability to extend their audience beyond local educators, and creates opportunity for a worldwide conversation surrounding art.

Recommendations for Future Research

My study addressed two specific elementary school teachers as they used iPads and online museum resources. Given the experiences I have had in conducting this study, there is more research needed in schools, museums, and universities, though all of them share one audience in common: teachers. It has become abundantly clear to me during my research that without the voice of the teacher, museums cannot be certain their

resources are meeting existing needs. Pedagogy and the school climate change rapidly, and only teachers can provide concrete, contemporary viewpoints about what is feasible and likely successful within a classroom. Each of the recommendations for research below should thus include a teacher's voice, whether in development, practice, or evaluation.

After conducting my study, several research questions come to mind. Given a similar cooperation with a pair of elementary teachers, what skills and knowledge are gained by elementary students using museum resources in the classroom? What could a case study illuminate in terms of what museum educators hope students are learning, versus what they are able to articulate after using museum resources? A longitudinal case study may create the opportunity for teachers to test the effectiveness of a variety of types of museum resources throughout the school year, monitoring not only student response but also if the type of resource impacted this response. Studies to determine what types of art and technology skills can be learned from this type of mobile engagement will benefit not only art museums, but also technologists and the field of educational technology. Additionally, giving teachers both the support and flexibility to integrate and adjust lesson plans would bring an element of action research to the case study, reflecting the true nature of teaching. After making slight adjustments from one class session to another, June made larger adjustments to her lesson plan from my first day of observation to the next. Built into her teaching practice are elements of action research, intentionally reflecting and changing lessons based on experience, which I think is a logical match with teachers and technology. There is much to be learned from how teachers adjust from one day to the next, and with technology, especially, the practice of reflecting on positive and negative details found in action research could be beneficial.

Additionally, opportunities to engage students in research should be explored as well. Students today are much more well versed in technology than their teachers, given their lifelong familiarity with digital tools. Some research with technology integration found teachers looking to the students to help when they needed troubleshooting (Benton, 2012). I am interested in the types of case study research that could be done in collaboration with students. I wonder what kinds of suggestions or recommendations students today, many of whom have never lived in a world without iPads, would have about the way technology could and should be used in the classroom and the museum. Does the fact that they have always had technology available make them more or less likely to want to use it? What assumptions have we made as adults concerning how children view technology? Students of different ages may illuminate new and different strategies, so either studying these individuals over time or sampling different age groups may be beneficial.

Also, a case study detailing how a university and an art museum collaborate to create a mobile application would also be beneficial to the field, in order to address opportunities and prevent missteps. Through this collaboration, art museum education staff can hope to create resources that are effective for today's classrooms, but also utilize existing collections. Can what occurred with the Philadelphia Art Museum and Drexel University be replicated? This application is likely not the only example of such a collaboration, though I agree the execution and simplicity of *Physics at the Art Museum* should serve as a prime example for how to effectively use art objects and bring them to life digitally. It was also significant to me that the partners utilized Philadelphia teachers and students to evaluate the application. Bringing the teacher's voice into the fold is essential to ensuring that resources meet the needs of teachers. Finally, the fact that the museum and university partnered to make a mobile application is significant as well.

Students of the university gained real-life practice of their educational technology skills while the museum benefitted by publishing an effective and useful mobile application. The power of iPads seems to lie in their use, which is determined by the application a user chooses. Mobile applications offer museums the ability to create lessons digitally, including combining the experience of interacting with art objects in conjunction with the possibilities of technology. Collaborating with universities also offers a learning opportunity for university students as well.

SIGNIFICANCE TO THE FIELD

Education is evolving, as classrooms shift towards learner-centered pedagogies with technological tools. Teachers are developing and refining skills necessary to create these complex learning environments with authentic experiences for students. Art museum collections are ripe with curricular connections for these authentic experiences, and the ability to connect students to artworks is possible through mobile technology. For these connections to be made effectively, though, art museums educators must collaborate with teachers to learn about the types of curricular needs resources should address. From working with a pair of teachers to integrate online art museum resources into classroom curriculum with iPads, this study illuminates how the teacher's voice can be used to answer questions of a museum technologist. The needs of classroom teachers may only be fully met once they are heard; art museum education staff must be available to listen, and then to act.

This research combines the voices of one art specialist, one math teacher, and one museums educator/technologist to bring art museum resources into the classroom through mobile technology. The narrative we produced reflects current areas of success and opportunity as they pertain to classrooms today. Jon taught his lesson with twice the

number of students as he usually does. While this is clearly not the ideal, these types of situations happen in classrooms every day. Jon's ability to conduct the lesson effectively despite this setback illuminates the resourcefulness and flexibility developed over years of teaching. To encapsulate these struggles alongside the successes of teaching is important to delineate in research as a reflection of real life. June's very specific recommendations and requests concerning how technology specialists and art museum educators develop teacher resources are needed in order for them to address values important to teachers today. The opportunity to gather direct feedback from classroom educators in research is not taken often enough, and this research hopes to contribute to filling this need.

The two applications considered in this study are the tip of the iceberg in terms of what is available for classroom educators to choose from today, and even more will be available in the future. This research hopes to contribute to an understanding of what is available, what was useful for classroom educators, and what would be possible in the future. Most significantly, the ability for teachers to find multiple entry points into the content was useful for both teachers to apply the applications to their curriculum. Crossing over between content areas was also beneficial in the classroom and offers potential for art objects to be used in a multitude of educational arenas through museum resources. I argue the use of technology in this study extends the walls of the museum and provides an opportunity not given in the museum itself. Technology gives art museums the opportunity to create participatory, meaning-making experiences, even when visitors are not at the museum. Art education, while providing plenty of physical art experiences, sometimes neglects to celebrate the possibilities in technology. This thesis sheds light on the potential that exists for creating digital art experiences with students

from even a young age, in order to foster the types of skills necessary to describe, analyze, and reflect upon artwork and connect that artwork to other subjects.

CLOSING REMARKS

I conducted this study to utilize my skills in technology, my love for the art museum, and to make an impact on classroom teachers. I see the potential for mobile technology to democratize information and education, to give power to users and visitors like never before. In order for art museums to remain essential in the eyes of the younger public, they must take advantage of technology and the role it can play in user interaction. Whether the audience is teachers or twenty somethings, effective uses of technology can enhance the experience of viewing an artwork, even if the viewing experience comes through a tablet screen. By embracing technology as a legitimate way to share and experience art, the art museum can transform visitors' interactions with the gallery itself as the culminating visit in an experience that began digitally. If the only means for a student to view an artwork is on a tablet, then the experience afforded by technology to give new perspectives or information may make an impression on the student to try to see the work in person as an adult. Especially in a time where a visit to the art museum is becoming harder and harder to fund in public schools, the potential for technology to connect museums to virtual visitors, especially elementary classrooms, must be realized. Technology offers art museums the chance to connect to so many more people than ever, and enables visitors to engage with the artwork in a more participatory way than what occurred in any previous generation. It is more important to me that people, whether children or adults, take the time to think about, look at, and create art.

Appendices

APPENDIX A

April 23, 2015

Dr. James Wilson

Chair, Institutional Review Board

P.O. Box 7426

Austin, TX 78713

irbchair@austin.utexas.edu

Dear Dr. Wilson:

The purpose of this letter is to grant Kimberly Varela, a graduate student at the University of Texas at Austin permission to conduct research at the Austin Discovery School. The project, "Museum Resources and Mobile Technology in Classroom Curriculum" entails interview and observation with two teachers. The teachers, Jon McSween and [redacted] will be interviewed about their teaching history, philosophies, and beliefs about technology use. Teachers are also encouraged to take written or audio journals about their planning process as it occurs. Then, they will each conduct a lesson in which they have used mobile technology and online museum resources to prepare or deliver content. The researcher will be present in class to observe and take written notes. A second interview will be conducted after the lesson to reflect upon how mobile technology impacted their curriculum or teaching style. Both the interviews and lessons will, ideally, take place in the next two-three weeks. The Austin Discovery School was selected because of the innovative teaching by classroom educators. I am the Head of School here at the Austin Discovery School. Results of this study will be shared via electronic mail after the report is finished in August 2015. I, Leigh Moss, do hereby grant permission for Kimberly Varela to conduct Museum Resources and Mobile Technology in Classroom Curriculum at the Austin Discovery School.

Sincerely,

APPENDIX B

IRB USE ONLY
Study Number:
Approval Date:
Expires:
Name of Funding Agency (if applicable):

Consent for Participation in Research

Title: Museum Resources and Mobile Technology in Classroom Curriculum

Introduction

The purpose of this form is to provide you information that may affect your decision as to whether or not to participate in this research study. The person performing the research will answer any of your questions. Read the information below and ask any questions you might have before deciding whether or not to take part. If you decide to be involved in this study, this form will be used to record your consent.

Purpose of the Study

You have been asked to participate in a research study about how mobile technology is used to develop curriculum to implement online art museum resources. The purpose of this study is to gain a better understanding of how iPads are utilized by teachers as they plan curriculum, and how the online resources created by art museums are used during this process.

What will you be asked to do?

If you agree to participate in this study, you will be asked to

Create one lesson in your class which utilizes online museum resources and technology

Participate in two semi structured interviews with the researcher

Audio record reflections during the curriculum planning process.

Allow researcher to observe and take notes during the dissemination of this lesson.

This study will last one to two months, depending on your curricular needs and schedule. Each interview should last less than 2 hours. Audio recordings should last as long and be as frequent as you see fit. The study will conclude at the end of the final interview, which will take place as soon after the lesson as is convenient. This study will include approximately 2 study participants.

Your participation will be audio recorded.

What are the risks involved in this study?

There are no foreseeable risks to participating in this study.

What are the possible benefits of this study?

You will receive no direct benefit from participating in this study; however, the research conducted here will contribute to a meaningful body of research taking place with the direct participation of classroom educators. This research has implications towards future resources and professional development opportunities offered for educators.

Do you have to participate?

No, your participation is voluntary. You may decide not to participate at all or, if you start the study, you may withdraw at any time. Withdrawal or refusing to participate

will not affect your relationship with The University of Texas at Austin (University) in anyway.

If you would like to participate, please return this form to Kim Varela in person or via PDF at kimvarela@utexas.edu. You will receive a copy of this form.

Will there be any compensation?

You will not receive any type of payment participating in this study.

How will your privacy and confidentiality be protected if you participate in this research study?

Your privacy and the confidentiality of your data will be protected. Any audio will be transcribed and stored securely. All data will be stored on password protected computers and thumb drives in password protected folders. If you request, pseudonyms may be used.

If it becomes necessary for the Institutional Review Board to review the study records, information that can be linked to you will be protected to the extent permitted by law. Your research records will not be released without your consent unless required by law or a court order. The data resulting from your participation may be made available to other researchers in the future for research purposes not detailed within this consent form. In these cases, the data will contain no identifying information that could associate it with you, or with your participation in any study.

If you choose to participate in this study, you will be audio recorded. Any audio recordings will be stored securely and only the research team will have access to the

recordings. Recordings will be kept for the duration of the study (August 2015) and then erased.

Whom to contact with questions about the study?

Prior, during or after your participation you can contact the researcher Kim Varela at (909) 518-2284 or send an email to kimvarela@utexas.edu for any questions or if you feel that you have been harmed.

Whom to contact with questions concerning your rights as a research participant?

For questions about your rights or any dissatisfaction with any part of this study, you can contact, anonymously if you wish, the Institutional Review Board by phone at (512) 471-8871 or email at orsc@uts.cc.utexas.edu.

Participation

If you agree to participate please return this form in person to Kim Varela or electronically by returning a signed PDF to kimvarela@utexas.edu

Signature

You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time. You voluntarily agree to participate in this study. By signing this form, you are not waiving any of your legal rights.

_____

Printed Name

_____ _____

Signature Date

I give permission for the researcher to use my name in this research: (please check)

_____ Yes _____ No

As a representative of this study, I have explained the purpose, procedures, benefits, and the risks involved in this research study.

_____

Print Name of Person obtaining consent

_____ _____

Signature of Person obtaining consent Date

APPENDIX C

Pre Interview Questions: Classroom Educator/Art Specialist

1. Tell me a bit about your teaching career and curricular philosophy.
2. Generally, how willing are you to try something new in the classroom?
3. How long have you been using iPads/mobile device?
4. How would you describe your comfort level with technology?
5. What kinds of training did you receive for the implementation of your iPad/mobile device?
6. What school-related tasks do you use your iPad/mobile device for?
7. Have you attended any teacher trainings from art museums? If so, what resources from these trainings do you utilize?
8. Have you used an audio or written journal in reference to your teaching before? If so, how has it effected your teaching?
9. What online resources do you use to develop curriculum?
10. What online art resources do you use to create lessons?

Post-Lesson Interview Questions: Classroom Educator/Art Specialist

1. Has your teaching philosophy changed during this experience?
2. How has your comfort level with technology changed?
3. In what ways did audio journaling contribute or detract from your experience in planning curriculum?
4. What about your initial iPad training did you find most helpful in practice?
5. What tasks will you complete with your iPad that you wouldn't have before?
6. What resources have you learned about in this experience that you will use in the future?

7. What aspects of the museum training would you change to help your implementation in the classroom?

APPENDIX D

Over Arching project = Math in the Museum

Opening conversation:

8:10-8:15 – What are museums, what museums have you been to and what did you like about them?

Guiding Question: Is math discovered or invented?

10 minute clip from NOVA

http://www.pbs.org/wgbh/nova/blogs/physics/2015/04/great-math-mystery/

Follow the clip with a brief share out of ideas the clip gave them about math and where it can be found or layered into our understanding of the world.

8:40 – 9:25 Assign the following topics to brainstorm and find avenues to search for mathematical links:

Air Table – Arts (visual and performing)

Water Table – Nature

Earth Table – Games (board, virtual and athletic)

Fire Table – Narrative / story telling

While students are working, call one to two students from each group to work on a lesson on the iPad at the rainbow table using the physics in the Museum app from the Philadelphia Art Museum. Send students to a different table than they were originally at and have them send another student to work on the app. Circulate and ask probing questions, take unfocused students and switch their groups until a good it is found. Guide students to thinking about how a museum exhibit could prove whether math was invented, discovered or both.

9:25 – 9:35 – Share out

1. How did the App integrate math, physics and art (hopefully several answers form the several ways the topics are explored)?

2. How can you find math in various aspects of life that are not math or science?

3. What ideas for museum exhibits do you have that can show your belief on the origins of math?

APPENDIX E

NOTES:

I wasn't quite sure how I was going to approach this lesson as a very novice i-pad user. I wanted to experiment with the different ways that I could use this tool… Since it was the end of the year, I had slated this the week to discuss the ADS Summer Art Challenge. I was hoping to tie in the challenge and the technology, had hoped something would hit me after playing a bit.

- Color me in- didn't understand it at first glance. Eventually got to the videos and still don't really understand how to use it…
- The Museum Explores: At first glance the art didn't seem the type of art that I wanted to discuss with kinder kids, but I really liked the break-down of the pieces- How the Artist worked etc… this seems applicable with older kids.
- Art Cloud: Tempting to use this, however, like books there were images of nudity in the Picasso images. Don't have enough time to deal with the excitement this causes in the classroom. Chose not to use the app.
- Kimbell: Pretty cool that there was an audio portion to this. I happened to be teaching a lesson on painting pinch pots and we had been discussing now pots have been created by ceramicists or potters for ages. I decided to show them the Codex-Style Vase with two Scenes of Pawahtun Instructing Scribes and let them listen to most of the audio. It worked pretty well and I paused the audio to show them what the art historian was talking about.
- The Portland Art Museum show, Feast and Famine, was pretty interesting. I brainstormed introducing the idea of a visual feast to the kids- having my students peruse the images and discuss, then lead up to them creating a dinner scene where

they all sat at a long table and create their favorite meal in some medium for their place setting… but one art work was a little gruesome. I can't tell if you can hide images on any of these apps, but it would be cool to pick and choose what the kids see…

- MOMA: Pretty nice collection of images. The interactivity was interesting, but for non readers (kinders) it wasn't going to work for me. I quickly moved on.
- Museum of London Street Museum: Didn't get it.
- Timeline: I could see using something like this for art history in the future…
- Getty: I showed one pinch pot class the Lidded Bowl. It wasn't very engaging and I opted out of using it again. Very difficult to show entire class image with only 1 I-pad.

ART MAKING/ GAMES:

I experimented with some of the Art making tools, but started to get nervous about the fact that we didn't have an i-pad for every kid. I quickly moved to art games wondering if something might lend itself to partners. NGAkids seemed like a really fun option of being able to virtually bring my students to a museum (One of the Art Summer Challenges!) and also let them create. I think I landed on my curriculum piece ☺

APPENDIX F

ADS SUMMER ART CHALLENGE!

Welcome to the Summer Art Challenge! You are invited to play along and stretch your creativity this summer.
These challenges are designed to keep the creative part of your brain playing over the summer. They might be fun for a rainy day or a family outing. Some of these may require adult supervision or help. Your mission if you choose to accept it is to complete as many of the challenges listed below.

Level 1: Complete 5 challenges in any order.
Level 2: Complete 10 challenges
Level 3: Complete 15 or more challenges!

Documentation is important. All challenges should be recorded with things such as a photograph, writing, a computer print-out or an actual artwork. Some of the finished work will be put on a bulletin board in the fall. Use a folder to gather items.
Turn in your challenges when you return to school in the fall for high 5's and small prizes.

Have fun MAKING, DOING and EXPLORING!- **Ms. Juliet**

1. **Art Outing:** Visit an art museum while on vacation or in Austin (The Blanton, the Contemporary Austin, Mexic-Arte Museum, Umlauf Sculpture Garden & Museum, Laguna Gloria, Mexican-American Cultural Center, Visual Arts Center). Documentation possibilities: a photograph of you at the art museum, a postcard from the gift shop (if one) or a sketch you drew of a favorite artwork.
2. **"Me" Collage:** Use magazines, photos and your own drawings to create an "About Me" collage. If you need inspiration, go to google images and search for "collage artist". Documentation: a photo of your collage or the actual collage.
3. **Read a graphic novel or comic:** Go to your library and check out a book with images or comics. For older kids, two good suggestions are The Invention of Hugo Cabret or Wonderstruck by Brian Selcznick. For younger kids, Garfield and TinTin classic comics and stories would be enjoyable. Ask your librarian for suggestions! Documentation: Write a short description of the book you read or create a bookmark for the book.
4. **Play with an online drawing game:** Print out your results. Here are some ideas:

   http://mrdoob.com/projects/harmony
   http://jacksonpollock.org
   www.picassohead.com
   http://artpad.art.com/artpad/painter

http://bomomo.com/

5. **Take an art class or summer workshop:** Documentation: Your finished artwork or a photo of you making your artwork.
6. **Recycled Art:** Find discarded objects around the house (old junk mail, pieces of wood scraps, random toys or old stickers you don't want anymore) and create a new inspiring collage or sculpture.
7. **Environmental Art:** Use leaves, rocks and other natural objects to make a piece of art. Look up the art of Andy Goldsworthy for ideas. Documentation: Take a photo of your finished artwork.
8. **Photomontage:** Take lots of photos. With permission from your parents, cut out faces or parts of the pictures and combine them to create an interesting photomontage. Look up the photomontages of David Hockney if you need ideas. Documentation: Turn in the original artwork.
9. **Collaborative Artwork:** Collaborate with a friend or family member and make a work of art together! Documentation: Photo of the two of you working or the finished artwork.
10. **Sidewalk Chalk Masterpiece:** Use sidewalk chalk in a creative way to make a masterpiece. Take a photo of your finished work.
11. **Comic Art:** Draw a comic about something that happened to you this summer. Documentation: Turn in the original comic.
12. **Fashion:** Decorate a t-shirt or sew a piece of clothing! Ideas: tie-dye, stencils, sew something on it, paint pens or fabric paint. Documentation: Bring in the item of clothing or a photo.
13. **Jewelry:** Make something to wear. Ideas: friendship bracelets, glass (go to Fire It Up Pottery!), beads. Documentation: Bring in the jewelry or a photo.
14. **Rock Painting:** Find the perfect rock outside. Decorate it with paints and anything else you'd like. Documentation: Photograph it or bring in the actual rock.
15. **Sculpture:** Design an artwork to hang from a branch of a tree. Take a photograph of the sculpture in the tree.
16. **Musical Instrument:** Create a musical instrument using materials around your house. Documentation: photograph or bring in the instrument.
17. **Building:** Using Legos, blocks or other building materials, spend an hour or so designing a unique construction. Take a photograph of your masterpiece.
18. **Make a piñata using paper mache:** Break it with some friends! Take pictures.
19. **Create edible art:** Play with your food and turn it into an artwork. Or, decorate a cake. Take a photo and then eat it!
20. **YOUR CHOICE:** Come up with a creative activity to do by yourself or with your family.

APPENDIX G

Kindergarten Art Lesson 36: Summer Art Challenge

Art Objective: Discuss Summer Art Challenge. Discuss museums.

Vocabulary: Museum

Materials:

- iPads
- Summer Art Challenge Sheets

Instructional Resources: NGA kids Art Zone App

Introduction:

- Begin by telling children that we have ONE more art class left after this one! We have learned a LOT this year! To prepare for the summer I am introduce the ADS SUMMER ART CHALLENGE! There are lots of really cool things to do on this list and I really hope you can tell me all about some of your art adventures when I see you as 1st graders!
- **Level 1: Complete 5 challenges in any order.**
- **Level 2: Complete 10 challenges**
- **Level 3: Complete 15 or more challenges!**
- Documentation is important. All challenges should be recorded with things such as a photograph, writing, a computer print-out or an actual artwork. Some of the finished work will be put on a bulletin board in the fall. Use a folder to gather items.
- Turn in your challenges when you return to school in the fall for high 5's and small prizes.
- The first cool challenge is to go on an ART OUTING to one of the great museums we have in Austin! OR if you are lucky, go to a museum outside of Austin.

- ***What's a museum? Can we touch the art in a museum? Can we paint on a famous painting in a museum?*** Usually we look with our eyes, but there are some museums where you can touch things. *Most of the time* we can't paint on famous artwork.
- Lots of us don't have opportunities to go to all of the museums we want to in the world so sometimes we have to figure out another way to experience some of the art that we are interested in. Today we are going to be playing with an app from the *National Gallery of Art* in Washington D.C.

Hands-on Procedures:

1. First, learners will get into pairs and we will be taking turns using the i-pad to play with art from the National Art Gallery.
2. Show the kids how to start by making the American Folk Art Avatar taking turns with a volunteer partner.
3. Show them that they can scroll through and manipulate famous artwork: They should start with the Rauschenberg. Who picked up trash and found objects that interested him on the streets of New York City and brought these back to his studio where they could become integrated into his work.
4. When done, they can explore the : Landscape, Seascape, Still life, Abstract Expressionist

APPENDIX H

Kindergarten Art Lesson 36: Summer Art Challenge

Art Objective: Discuss Summer Art Challenge. Discuss museums.

Vocabulary: Museum, Landscape, Seascape, Still Life

Materials:

- iPads
- Summer Art Challenge Sheets

Instructional Resources:

- NGA kids Art Zone App
- Fancy Nancy at the museum

Introduction:

- We have ONE more art class left after this one! We have learned a LOT this year! To prepare for the summer I am introduce the ADS SUMMER ART CHALLENGE! There are lots of really cool things to do on this list and I really hope you can tell me all about some of your art adventures when I see you as 1st graders!
- **Level 1: Complete 5 challenges in any order.**
- **Level 2: Complete 10 challenges**
- **Level 3: Complete 15 or more challenges!**
- The first cool challenge is to go on an ART OUTING to one of the great museums we have in Austin! OR if you are lucky, go to a museum outside of Austin.
- Let's get ready for our imaginary trip to the ART MUSEUM in Washington DC… Read part of: *Fancy Nancy at the Museum*

- ***What's a museum? Can we touch the art in a museum? Can we paint on a famous painting in a museum?*** Usually we look with our eyes, but there are some museums where you can touch things. *Most of the time* we can't paint on famous artwork.
- Lots of us don't have opportunities to go to all of the museums we want to in the world so sometimes we have to figure out another way to experience some of the art that we are interested in. Today we are going to be playing with an app from the *National Gallery of Art* in Washington D.C. and creating our OWN art in the museum.
- Show the students how to SAVE their work to show other students.
- What are some of the rules of using an iPad to keep it safe?
    - Take turns!
    - Water bottles away from device
    - Keep the iPad on the table.

Hands-on Procedures:

1. Introduce how we will be taking turns using the iPad to play with art from the National Art Gallery.
2. Show the kids how to start by making the American Folk Art Avatar taking turns with a volunteer partner.
3. Teacher will divide learners into pairs to receive their iPad.
4. When done, they can explore the : Landscape, Seascape, Still life, Abstract Expressionist
5. During the art making, make an announcement that in the last 10 minutes of class they should share with the people at the table what they have been working on.

Clean up

1. Students will keep their iPad on the table and line up when teacher calls on them.
2. Teacher will collect iPads

APPENDIX I

The majority of these are free, though a few are paid. Those with * indicate they were made by a museum.

Museum Apps
Colour Me In
App from Esbjerg Art Museum, correlating with their exhibition of the same name. Includes five short (~1 minute) videos of the colorful space.
The Museum Explores (Explore Eng)
From the Museu Nacional D'Arte de Catalunya
Includes 10 case studies about different paintings, I.e. Interesting stories about the artists, how they had been altered, etc.
Portland Art Museum
App from their Feast and Famine show
Features essay & artwork of different pieces about food
Picasso
From the Picasso museum
Images of all of their pieces, separated by gallery/period (Cubism, Blue Period, etc.)
Artsonia
App of the NAEA lesson plan site. Needs access code?
The Getty: the Life of Art
Offers four pieces of artwork, asking why they were made/functioned. Asks students to read, but could be used with help?
The Kimbell
Museum application, allows you to download (for free) tours, which gives thumbnails for each piece, accompanied by short audio pieces. Includes a kids tour!
Art museum timeline
Art history timeline of artwork, requires reading descriptions, not much multimedia
Rijks museum
Guided tours simulate being in the galleries
Museum of Contemporary art Australia
Videos of video art from an exhibition at the MCA.
ArtLens
Application from the Cleveland museum of art. Includes tours with videos
Moma Abstract Expressionism
Browsing abstract expressionism artworks, with title and artist.
Museum of London street museum
Map of London with pins that show historic photographs and artwork from that area.

Art Games
Line It Up
Shape game, asks students to move lines and items to follow written directions.

Blendoku
Color theory game
*Exploratorium Color Uncovered
Explore color theory with small activities, requires some reading.
Art Puzzle Lite
Famous paintings that you have to rearrange

Art Making
* MoMA art lab
Shapes and colors to create artworks, or activities to create sound compositions, mobiles, collage, scissors (paper cutting), line design, "exquisite corpse", shape poem.
*NGA Kids
Allows students to rearrange and reimagine works of art, create images inspired by others, and collage. Written directions.
Studio
Photo editing, allows you to add filters and text, shapes, etc.
Mosaics
Students can use shapes and colors to create their own mosaic pieces on the iPad.

Art Set, Paper, Art Studio, sketches, and SketchBookX
Various sketching programs with a variety of pen/pencil/brush options and colors

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